117
3516

117(351

Proceedings of
the United States
National Museum

SMITHSONIAN INSTITUTION • WASHINGTON, D.C.

Number 3516 1965 Volume 117, Pages 459–552

LIBRARY
FEB 1 0 1966
FISH & WILDLIFE SERVICE

MARINE AMPHIPODA OF ATOLLS IN MICRONESIA

By J. LAURENS BARNARD

Proceedings of the United States National Museum

SMITHSONIAN INSTITUTION · WASHINGTON, D.C.

Volume 117 1965 Number 3516

MARINE AMPHIPODA OF ATOLLS IN MICRONESIA

By J. Laurens Barnard
Associate Curator, Division of Crustacea

Introduction

Two large collections of intertidal and sublittoral Amphipoda were made on several atolls of Micronesia, one containing material collected by Dr. D. P. Abbott of Stanford University and Dr. F. M. Bayer of the Smithsonian Institution on Ifaluk Atoll, and by Dr. Cadet Hand of the University of California on Kapingamarangi Atoll, and the other by Dr. D. J. Reish of Long Beach State College, California, on Eniwetok, Majuro, and Bikini atolls. The Abbott-Bayer-Hand collection was made available to me by Dr. Fenner A. Chace, Jr. of the U.S. National Museum, and a small grant was provided from the National Research Council for initial sorting of the specimens. The collections of Dr. Reish were made possible by help from the Atomic Energy Commission. All specimens have been deposited in the U.S. National Museum. I am most grateful to the Beaudette Foundation for my support during this investigation. Dr. Abbott very kindly reviewed the manuscript and made several valuable suggestions.

Previous studies.—Tropical Pacific amphipods have not been studied extensively but the fauna would be expected to contain species common to other parts of the tropics, such as the Indian Ocean and Red Sea. Therefore, few of the common species in the collections proved to be new, especially since Schellenberg (1938a) had already reported on collections from Fiji, Gilbert, Ellice, Marshall and

Hawaiian islands. Chevreux (1908) reported on amphipods of the Gambier archipelago. Dana (1853) described numerous tropical Pacific species, some of them still obscure because only the females were described; but his work provided the groundwork for later study.

Other important tropical studies were made in the Indian Ocean by Chevreux (1901, Seychelles) and Walker (1904, Ceylon; 1905, Laccadives and Maldives; 1909, general) and in the Red Sea by Schellenberg (1928) and Spandl (1924). The numerous works of Haswell, Chilton and Hurley in Australia and New Zealand show that little relationship of those faunas is borne to the tropics, but of course the northern half of Australia still has not been explored for amphipods. Pirlot's excellent series of Siboga monographs (1930–38), although primarily of interest for the deep sea, nevertheless contains valuable information on shallow-water Indonesian and Philippine amphipods.

Faunistic impoverishment of atolls.—Atolls and small volcanic islands of Micronesia are of especial interest to faunistic biologists because an impoverishment of many groups of organisms would be expected in comparison with faunas of large islands and continents in the tropics. Micronesia primarily offers an epifaunal environment in the shallow sea, with scarce remnants of muddy coastal shelves fringing larger islands and continents. Hence the lack of shallow sea bottoms, the diminution of environmental variability and the decrease of food from runoff should be limiting factors. Since most Amphipoda are either debris and detritus feeders or algal chewers they especially should be restricted in diversity. Although fine calcareous muds exist in lagoons of atolls and support burrowing amphipods, apparently not many dredgings or grab samples have been taken in the past, for there are few ampeliscids, phoxocephalids, haustoriids, and oedicerotids reported from atolls or sharply sloped islands and few are expected because atoll waters are so free of the detrital food of these organisms. Thus, the amphipod fauna of atolls should be composed largely of those species nestling in epifaunal coral reefs, those chewing the limited fleshy algae in these environments, and the inquilinous forms that are subparasites in coelenterates, ascidians, and sponges. In comparison with continents, atolls should present a repletion of these hosts, especially coelenterates.

Unfortunately, the amphipods of continents in the tropics are poorly known so that comparison with islands is impossible. A great deal of work remains to be done in Indonesia, the south China Sea and all the continental coasts of the tropical Indian Ocean before any idea of faunal diversity is realized. Many other comparisons of vital interest are impossible because of the lack of knowledge in the area so outlined. For instance, it is not known whether increased diversification of amphipods occurs from the cold-temperate to the tropics because of

increased temperature or whether this diversification is associated with the richer epifaunal habitats of the tropics. No comparisons of the tropical Indo-Pacific with the eastern Pacific and Atlantic Oceans can be made.

TROPICAL INDO-PACIFIC AMPHIPOD FAUNA.—A summary of the gammaridean Amphipoda of the tropical Indo-Pacific is presented in table 1. It is restricted to species found between the Tropics of Cancer and Capricorn from the east shores of Africa to the Marquesas Islands and includes the Red Sea. It contains species found intertidally and subtidally down to depths of 200 feet. Not included are the terrestrial species of the Talitridae nor oceanic pelagic species.

Of shallow water marine faunas it has been presumed that the Indo-Pacific represents the longest known belt of relatively uniform environment in terms of narrow temperature range and so it is expected that a large proportion of species ranges throughout the Indo-Pacific. Barriers to dispersal of animals are most notable in the eastern part of the Indo-Pacific where long stretches of open sea separate archipelagoes.

Amphipoda are crustaceans brooding their eggs and hatching their young as miniature adults so that dispersal is not accomplished by pelagic larvae. That so many species of Amphipoda, not only in the tropics but in colder regions, have been disposed over widespread areas attests to their dispersive success, regardless of the lack of larvae. A number of species appears to be transported successfully on floating algae. Through the courtesy of Dr. Torben Wolff, the writer examined samples of floating seaweed collected by the *Galathea* Expedition in the Indo-Pacific region, in the Mozambique Channel, Seychelles, Celebes, and Philippine Sea. Amphipods often were collected from these materials in great abundance, especially *Ampithoe ramondi*, *Cymadusa filosa*, *Elasmopus pectenicrus* (note that *E. ecuadorensis* appears to be a variety of this), and *Stenothoe gallensis*. All of these species are widely spread in the intertidal of the Indo-Pacific and probably they form a normal faunal component on floating seaweeds, perhaps in greater density than that found on attached plants. Expeditions should be advised to collect more surface flotsam to discover other amphipods being dispersed in this manner.

Amphipods dwelling on intertidal algae probably are more widely distributed in the Indo-Pacific because of accidental dispersal by means of flotsam than are those species living on the sublittoral benthos and building tubes or nestling among fixed bits of hard substrate. Nevertheless, many sublittoral amphipods span deep barriers.

Although many groups of animals have been studied extensively in the tropics, little effort has been expended on the Amphipoda. One problem is that amphipods are quite small in the tropics (J. L.

Barnard 1962d); they are difficult to study because techniques of amphipod study have not benefitted from those of copepodologists or ostracodologists. Often the animals are so small that they are overlooked or are lost in coarse-meshed screens; hence, the best known tropical amphipods are those that are largest, such as species of *Elasmopus*, *Paragrubia*, *Ampithoe*, *Maera*, and *Hyale*. Many tropical amphipods autotomize their appendages when preserved, making analysis more difficult. In addition, a high proportion of tropical Amphipoda belongs to genera where gnathopodal characters form the basis of identification and these characters appear only at or after sexual maturity and/or only in males; hence, female and juvenile specimens often cannot be identified without co-occurrence of males, and many samples are therefore worthless. Once life history studies can be conducted it will be possible to identify these nonmales, but the practicing faunistic taxonomist is often unable to solve such problems, especially when collections are so meager. Still another difficulty seems to be the large number of aberrations found in populations of tropical amphipods, especially in such dominant genera as *Hyale*, *Elasmopus*, *Maera*, and *Eurystheus*. These four genera are highly diverse, the known species in them numbering, respectively, 45, 35, 32, and 55 (worldwide). Aberrancies also occur rather more frequently in the species of these genera in colder waters than in other genera as observed by the writer. Because of their high diversity one would expect that the species of these genera would show more variation than species in smaller genera. Such morphological variants probably represent both mutants and ecophenotypes, and they pose problems often insoluble to the morphological taxonomist.

Potential atoll fauna.—Since atolls have little shelf area, therefore few silts and silty sands in the open sea surrounding them, the atoll fauna is largely epifaunal, composed mainly of species nestling in algae or building tubes on hard objects or inquilinous species commensal with larger organisms. In table 1, I have placed an asterisk on those species in these categories which I believe would occur in Micronesian atolls. I have eliminated from consideration those species known to burrow in soft bottoms, such as species of *Ampelisca*, *Paraphoxus*, *Urothoe* and all others for which ecological knowledge is poor.

The ubiquity of the tropical fauna is poorly demonstrated as shown by the occurrence of epifaunal species of amphipods (see table 1): Red Sea only, 11; Red Sea to Indonesia, 45; Indonesia to Hawaii, 63; Red Sea to Hawaii, 31; total, 150. Of those 150 potential atoll species, only 30 are known from the "Red Sea to Hawaii" (table 1, cols. 1–3, 5–7) or what I call pandemic in the Indo-Pacific. Since the Red Sea may have a number of endemic elements, I have cate-

gorized these separately. More species are now known from Indonesia to Hawaii than from the Red Sea to Indonesia, indicating that exploratory efforts in the past few decades have been concentrated in the Pacific rather than in the Indian Ocean as they were in earlier decades. No doubt a large share of those species now restricted to one side of Indonesia will turn up on the other side. Considerable exploration is warranted.

Including the present research, 65 species of amphipods are now known from Micronesia, of which 23 are technically endemic, 13 of these being described as new in this paper. All but 7 of the 65 species are considered to be algal or epifaunal dwellers. Thus, of 139 expected Indo-Pacific species (less those of the Red Sea), 58 have been collected in Micronesia. A better way to express the situation is to remove the endemic species from both figures so that, of 116 previously described species, only 35 have so far been collected in Micronesia.

Apparently, with the work of Schellenberg (1938a) and the present effort, the Micronesian amphipod fauna is better known than that of any other Indo-Pacific area, since more of the expected 150 epifaunal, possibly ubiquitous species (those with asterisks in table 1), have been collected in Micronesia. The number of epifaunal amphipod species reported from each Indo-Pacific region, with an expected total of 150, shows the following distribution: Red Sea, 41; E. Africa, 36; India, 52; Indonesia, 34; Micronesia, 58; Polynesia, 33; Hawaii, 23.

TABLE 1.—*List of Indo-Pacific tropical gammaridean Amphipoda from the literature* (*=Known epifaunal intertidal species; all others are subtidal, benthic, or of unknown ecology; species in parentheses are dubious. See J. L. Barnard, 1958, for references)

	Red Sea	East Africa	Arabian Sea, India, Bay of Bengal	Indonesia (North Australia)	Micronesia	Polynesia	Hawaiian Islands
Amaryllis macrophthalma (incl. *A. tenuipes*)	X	X	X				
Ampelisca australis						X	
Ampelisca brachyceras			X				
(*Ampelisca brevicornis*)	X	X	X				
Ampelisca cyclops		X	X	X			
Ampelisca cf. *daleyi* (not *Byblis daleyi* Pirlot 1936)			X				
Ampelisca lunata						X	
(*Ampelisca pusilla*)			X				
Ampelisca pygmaea						X	

TABLE 1.—*List of Indo-Pacific tropical gammaridean Amphipoda from the literature* (*= Known epifaunal intertidal species; all others are subtidal, benthic, or of unknown ecology; species in parentheses are dubious. See J. L. Barnard, 1958, for references)—Continued

	Red Sea	East Africa	Arabian Sea, India, Bay of Bengal	Indonesia (North Australia)	Micronesia	Polynesia	Hawaiian Islands
Ampelisca scabripes		X	X				
Ampelisca subbrevicornis				X			
(*Ampelisca tenuicornis*)		X					
Ampelisca tridens			X	X			
Ampelisca zamboangae	X		X	X			
Ampelisciphotis tridens				X			
**Amphilochus brunneus*			X				
**Amphilochus marionis*					X		X
**Amphilochus neapolitanus*		X					
Amphithoides longicornis	X						
Amphithoides patrizii		X					
**Ampithoe falsa*		X					
**Ampithoe orientalis*				X			X
**Ampithoe ramondi*	X	X	X	X	X	X	X
(*Ampithoe tongensis*)						X	
**Anamixis falarikia*, new species					X		
**Anamixis stebbingi*			X		X		
Andaniexis spinescens			X				
(*Anonyx amaurus*)			X				
(*Anonyx indicus*)			X				
(*Anonyx schmardae*)			X				
(*Aora typica*)			X			X	
Argissa hamatipes			X				
Aristias tropicus						X	
Arugella heterodonta				X			
Atylopsis latipalpus		X					
**Atylus guttatus*	X						
**Atylus granulosus*			X				
**Atylus minikoi*			X				
**Audulla chelifera*		X	X				
**Azotostoma fusta*, new species					X		
**Beaudettia palmeri*, new species					X		
Byblis crenulata				X			
Byblis daleyi of Pirlot 1936				X			
Byblis kallarthra				X			
Byblis lepta		X	X				
Byblis mucronata				X			
Byblis rhinoceros				X		X	
**Calliopius pictus*				X			
Ceina egregia				X			
**Ceradocus hawaiensis*							X
**Ceradocus rubromaculatus*	X	X	X	X	X	X	

TABLE 1.—*List of Indo-Pacific tropical gammaridean Amphipoda from the literature* (*= Known epifaunal intertidal species; all others are subtidal, benthic, or of unknown ecology; species in parentheses are dubious. See J. L. Barnard, 1958, for references)—Continued

	Red Sea	East Africa	Arabian Sea, India, Bay of Bengal	Indonesia (North Australia)	Micronesia	Polynesia	Hawaiian Islands
Cerapus tubularis (see J. L. Barnard 1962a)		X	X	X			
**Cheiriphotis megacheles*		X	X	X			
**Cheiriphotis monuropus*	X	X	X				
Chelura terebrans	X						
Chelura insulae				X	X	X	X
**Chevalia aviculae*	X	X	X				
**Colomastix hamifera*	X						
**Colomastix pusilla*	X		X		X		X
Concholestes dentalii			X				
Corophium acherusichum	X			X			X
Corophium acutum	X						
Corophium bonelli	X						
Corophium triaeonyx			X				
Corophium orientalis	X						
**Cymadusa brevidactyla*					X	X	
**Cymadusa filosa*	X	X	X	X	X		X
**Cymadusa hawaiensis*							X
**Cymadusa oceanica*							X
**Cyproidea ornata*	X		X			X	
**Cyproidea serratipalma*					X		
Cyrtophium orientale				X			
(*Dexamine miersi*)				X			
**Dexamine serraticrus*			X				
**Dexamine spinosa*	X						
**Dexamine thea*	X						
Dexaminella aegyptiaca	X						
**Dexaminoides orientalis*	X				X		
**Elasmopus atolgidus*, new species					X		
**Elasmopus buchneri*	X						
**Elasmopus ?brasiliensis*					X		
**Elasmopus calliactis*							X
**Elasmopus caprai*	X	X					
**Elasmopus dentiferus*					X	X	
**Elasmopus diplonyx*					X		
**Elasmopus dubius*			X				
**Elasmopus ecuadorensis hawaiensis*							X
**Elasmopus erythraeus*	X	X					
**Elasmopus excavatus*					X		
**Elasmopus gracilis*						X	
**Elasmopus minimus*				X		X	

TABLE 1.—*List of Indo-Pacific tropical gammaridean Amphipoda from the literature* (*=Known epifaunal intertidal species; all others are subtidal, benthic, or of unknown ecology; species in parentheses are dubious. See J. L. Barnard, 1958, for references)—Continued

	Red Sea	East Africa	Arabian Sea, India, Bay of Bengal	Indonesia (North Australia)	Micronesia	Polynesia	Hawaiian Islands
**Elasmopus pectenicrus*	X	X	X	X		X	X
**Elasmopus pocillimanus*					X		
**Elasmopus pseudaffinis*					X		
**Elasmopus rapax*	X	X	X		X	X	X
**Elasmopus spinidactylus*			X		X	X	
**Elasmopus spinimanus*			X	X	X		
**Elasmopus steinitzi*	X						
**Elasmopus suensis*				X			
Eriopisa chilkensis			X				
Eriopisella sechellensis	X		X				
Ericthonius brasiliensis	X	X	X				X
Ericthonius macrodactylus			X	X			
(*Ericthonius peculans*)				X			
Ericthonius pugnax				X			
**Eurystheus afer*	X	X					
**Eurystheus atlanticus*	X	X	X	X	X		
**Eurystheus digitatus*					X	X	
**Eurystheus imminens*	X						
**Eurystheus lophomeria*		X					
**Eurystheus pacificus*					X	X	
**Eurystheus setiferus*					X		
Eusiroides diplonyx			X	X	X		X
Eusiroides monoculoides			X?			X	
Eusiroides orchomenipes			X				
Glycerina tenuicornis			X	X			
Grandidierella bispinosa						X	
Grandidierella bonnieri			X				
Grandidierella gilesi			X	X			
Grandidierella gravipes			X				
Grandidierella macronyx			X				
Grandidierella mahafalensis		X					
Grandidierella megnae			X				
Grandidierella perlata						X	
Guernea coalita			X?				
Guernea petalocera	X						
Haustoriopsis reticulatus						X	
Hornellia incerta			X				
**Hyale affinis*						X	X
**Hyale bishopae*							X
**Hyale chevreuxi*			X		X		
**Hyale dentifera*					X	X	

TABLE 1.—*List of Indo-Pacific tropical gammaridean Amphipoda from the literature* (*=Known epifaunal intertidal species; all others are subtidal, benthic, or of unknown ecology; species in parentheses are dubious. See J. L. Barnard, 1958, for references)—Continued

	Red Sea	East Africa	Arabian Sea, India, Bay of Bengal	Indonesia (North Australia)	Micronesia	Polynesia	Hawaiian Islands
**Hyale galateae*				X			X
(*Hyale gracilis*)						X	
**Hyale honoluluensis*					X		X
**Hyale media* (incl. *H. ayeli*)			X		X		X
**Hyale nigra*	X	X					
(*Hyale orientalis*)				X			
**Hyale pusilla*						X	
Icilius ovalis				X			
Ichnopus taurus	X		X	X			
Idunella chilkensis			X				
Iphimedia discreta	X				X	X	
Iphimedia gladiolus		X					
Iphimedia orchestimana	X						
**Ischyrocerus* cfr. *inexpectatus*	X						
(*Ischyrocerus anguipes*)			X?				
Jassa falcata	X	X	X	X			
(*Jassa orientalis*)				X			
Kuria longimanus		X					
**Laetmatophilus leptocheir*		X					
**Lembos aequimanus*					X	X	X
**Lembos bryopsis*, new species					X		
**Lembos chelatus*			X				
(*Lembos fuegiensis*)						X	
**Lembos hastatus*					X		
**Lembos intermedius*							X
**Lembos kergueleni*		X	X				
**Lembos leptocheirus*	X	X					
**Lembos macromanus*				X			
**Lembos podoceroides*	X	X	X			X	
**Lembos processifer*				X	X		
(*Lembos tenuis*)				X			
**Lembos* species (cf. *francanni*)					X		
Leptocheirus pilosus		X					
**Leucothoe acanthopus*	X						
**Leucothoe brevidigitata*				X			
(*Leucothoe crassimana*)	X						
**Leucothoe furina*	X	X	X	X		X	
**Leucothoe hyhelia*, new species					X		
**Leucothoe minuscula*					X		
**Leucothoe micronesiae*, new species					X		

TABLE 1.—*List of Indo-Pacific tropical gammaridean Amphipoda from the literature* (*=Known epifaunal intertidal species; all others are subtidal, benthic, or of unknown ecology; species in parentheses are dubious. See J. L. Barnard, 1958, for references)—Continued

	Red Sea	East Africa	Arabian Sea, India, Bay of Bengal	Indonesia (North Australia)	Micronesia	Polynesia	Hawaiian Islands
?*Leucothoe spinicarpa* (=*Leucothoella bannwarthi*?)	X	X	X	X			
**Leucothoe stegoceras*	X		X				
**Leucothoe ?tridens*				X	X		
**Leucothoella bannwarthi*	X			X	X	X	
**Leucothoides pottsi*	X				X		
**Liagoceradocus pusillus*, new species					X		
Liljeborgia aequabilis				X			
Liljeborgia dubia				X			
(*Liljeborgia pallida*)			X				
Liljeborgia proxima					X	X	
Listriella dahli						X	
Lysianassa coelochir		X	X				
Lysianassa ceratina	X	X					
Lysianassa cinghalensis	X	X	X				
(*Maera aspera*)				X			
**Maera furcicornis*				X			
**Maera hamigera*	X				X		
**Maera inaequipes*	X	X	X		X		
**Maera inaequipes serrata*					X		
(*Maera indica*)				X			
**Maera insignis*			X	X	X	X	X
**Maera latibrachium*			X	X			
**Maera mastersi*				X		X	
(*Maera massavensis*)	X						
**Maera othonides*			X	X			
**Maera othonopsis*					X		
**Maera pacifica*					X	X	X
(*Maera pubescens*)					X		
**Maera quadrimana*					X	X	X
**Maera schellenbergi*	X						
**Maera sokotrae*		X					
**Maera subcarinata*		X	X	X			
*(*Maera tenella*)		X	X	X		X	
**Maera viridis*						X	
**Maerella tenuimana*				X			
Mandibulophoxus uncirostratus			X				
Megaluropus agilis	X		X				
**Megamphopus abbotti*, new species					X		
**Melita appendiculata* (=*fresneli*)	X	X	X	X			X

TABLE 1.—*List of Indo-Pacific tropical gammaridean Amphipoda from the literature* (*= Known epifaunal intertidal species; all others are subtidal, benthic, or of unknown ecology; species in parentheses are dubious. See J. L. Barnard 1958, for references)—Continued

	Red Sea	East Africa	Arabian Sea, India, Bay of Bengal	Indonesia (North Australia)	Micronesia	Polynesia	Hawaiian Islands
**Melita inaequistylis* (incl. *M. tenuicornis* of Walker 1909)			X				
**Melita obtusata*			X?				
**Microdeutopus tridens*					X		
Microlysias indica		X					
Microphotis blachei				X			
(*Microprotopus emissitius*)				X			
Ochlesis innocens				X	X		
Orchomenella nana			X				
Paracalliope fluviatilis			X				
Paracalliope indica			X				
Paradexamine flindersi				X			
**Paragrubia vorax*			X		X	X	X
Parambasia forbesi		X					
**Paranamixis bocki*					X	X	
Paraphoxus centralis							X
Paraphoxus rostratus				X			
Paraphoxus species of Pirlot				X			
**Parelasmopus albidus*					X	X	
**Parelasmopus resacus*, new species					X		
**Parelasmopus suluensis*	X	X	X	X		X	
**Parhyale hawaiensis*	X	X	X	X	X	X	X
Parhyalella indica			X				
Parhyalella pietschmanni							X
Perioculodes aequimanus	X						
Perioculodes cfr. *longimanus*	X		X				
Perioculodes (*megapleon*)			X				
Perioculodes serra			X				
Pereionotus testudo		X					
**Photis digitata*			X				
**Photis distinguenda*		X					
**Photis dolichommata*		X		X?			
**Photis geniculata*			X				
**Photis hawaiensis*							X
**Photis lamellifera*	X						
**Photis longicaudata*	X	X	X				
**Photis longimanus*			X				
**Photis nana*			X				
Platyischnopus herdmani			X				
(*Pleonexes dubius*)		X					
**Podocerus africanus*		X					

TABLE 1.—*List of Indo-Pacific tropical gammaridean Amphipoda from the literature* (*=Known epifaunal intertidal species; all others are subtidal, benthic, or of unknown ecology; species in parentheses are dubious. See J. L. Barnard 1958, for references)—Continued

	Red Sea	East Africa	Arabian Sea, India, Bay of Bengal	Indonesia (North Australia)	Micronesia	Polynesia	Hawaiian Islands
**Podocerus andamanensis*			X				
Podocerus brasiliensis	X	X	X				X
**Podocerus inconspicuus*		X		X			
**Podocerus laevis*			X				
**Podocerus ?lobatus*				X			
**Podocerus mangarevae*						X	
**Podocerus talegus*, new species					X		
**Podocerus zeylanicus*			X				
**Polycheria antarctica*			X	X			
**Polycheria atolli*	X	X	X				
**Pontogeneia pacifica*							X
Quadrivisio bengalensis		X	X			X	
**Ronco sosa*, new species					X		
Siphonoecetes erythraeus	X						
Siphonoecetes orientalis		X	X				
Socarnella bonnieri			X				
Sphaerophthalmus grobbeni	X						
**Stenothoe antennulariae*		X					
**Stenothoe gallensis*	X	X	X			X	X
(*Stenothoe guernii*)		X					
**Stenothoe monoculoides*			X				
Stenothoe valida	X						X
Sunamphitoe orientalis of K. H. Barnard 1937		X					
Sunamphitoe pelagica				X?			
**Synchelidium brevicarpum*			X				
**Synchelidium haplocheles*			X				
Synopia scheeleana			X				
Synopia ultramarina	X			X			
Synopia variabilis	X				X		
Syrrhoe semiserrata						X	
Tiron thompsoni			X				
Tmetonyx mucronatus				X			
Tryphosa cucullata			X				
Uncinlella lunata	X						
Urothoe elegans	X						
(*Urothoe irrostrata*)				X			
Urothoe pestai	X						
Urothoe spinidigitus			X				
Urothoe ruber			X				
Waldeckia kroyeri				X			

TABLE 1.—*List of Indo-Pacific tropical gammaridean Amphipoda from the literature* (*=Known epifaunal intertidal species; all others are subtidal, benthic, or of unknown ecology; species in parentheses are dubious. See J. L. Barnard, 1958, for references)—Continued

	Red Sea	East Africa	Arabian Sea, India, Bay of Bengal	Indonesia (North Australia)	Micronesia	Polynesia	Hawaiian Islands
**Xenocheira fasciata*				X			
**Xenocheira seurati*						X	

COMPOSITION OF THE COLLECTIONS.—The collections are divided into two major groups, those of Dr. Abbott from Ifaluk Atoll, with 794 specimens and those of Dr. Reish from Eniwetok, Bikini, and Majuro Atolls, with 851 specimens. Although the collections are similar in size, their relative compositions differ remarkably. Reish's collections were screened through a mesh of 0.5 mm.; hence a number of small species found in the Abbott collections apparently were lost. Of the 48 identified species in the two collections, only 17 were found in both, 23 were found only in the Ifaluk material and 8 were found only in the Eniwetok material. Many of the 23 from Ifaluk are small species, such as *Colomastix*, leucothoids, anamixids, and small gammarids. The 10 most abundant species from both collections are shown in table 2. Only 5 of these, according to their ubiquity indices (3 or above), are truly Indo-Pacific cosmopolitan forms. The remaining 5, so far have been reported only from the Pacific east of Indonesia and 3 of these have been discovered only in Micronesia. None of the top 10 is a new species and so most of the 5 Pacific forms may be endemic and not penetrate westward into the Indian Ocean.

Eleven of the 38 minor species, of lesser abundance than the top 10, are new. Of the remaining 26 species, probably 9 are truly pan-Indo-Pacific and pan-tropical as follows: *Leucothoella bannwarthi*, *Leucothoides pottsi*, *Colomastix pusilla*, *Elasmopus brasiliensis*, *Maera inaequipes*, *Hyale media*, *Dexaminoides orientalis*, *Eurystheus atlanticus*, and *Paragrubia vorax*. None of these was exceptionally abundant in the Micronesian collections.

Four of the new species appear to be inquilines associated with sessile animals of the substrate and probably feeding semiparasitically upon them. They are in the genera *Azotostoma*, *Anamixis*, and *Leucothoe*. The remaining new species are described in the genera *Ronco*, *Lembos*, *Elasmopus*, *Beaudettia*, *Pleonexes*, *Liagoceradocus*, *Megamphopus*, and *Podocerus*.

TABLE 2.—*Amphipods most abundant in the atoll samples collected* (Ubiquity index indicates number of areas through which species are distributed, from table 1; the higher the number, the more widespread the species)

Species	Total specimens	Ifaluk	Eniwetok Majuro Bikini	Ubiquity index
Elasmopus pseudaffinis	203	61	142	1
Cymadusa filosa [1]	185	60	125	6
Maera insignis	178	171	7	5
Elasmopus spinidactylus	174	35	139	3
Ampithoe ramondi [1]	126	1	125	7
Microdeutopus tridens	107	106	1	1
Hyale honoluluensis	74	0	74	2
Parhyale hawaiensis [1]	59	55	4	7
Eurystheus digitatus	59	40	19	2
Maera inaequipes serrata	55	44	11	1

[1] Cosmopolitan.

DOMINANT EPIFAUNAL GENERA.—Disregarding both those genera in table 1 known to occupy sandy and silt bottoms (such as *Ampelisca*, *Paraphoxus*, etc.) and brackish water genera (*Grandidierella* and *Corophium*) and considering only those species collected from washes of epifaunal materials such as algae, rocks, coral heads, it is seen that 8 large genera dominate tropical faunas (table 3). These dominant genera are best represented in the tropics as evidenced by a count of their species in the Arctic-subarctic, using two publications, Gurjanova (1951) and Shoemaker (1955). Casual inspection of Antarctic and subantarctic papers demonstrates the same relationships. Nevertheless, several of the genera, such as *Hyale*, *Photis*, and *Eurystheus*, are better represented in the subtropics, warm-temperate and cold-temperate than they are in the tropics. Probably this situation prevails because subtropical to cold-temperate zoogeographic provinces are more isolated from each other by temperature and continentally controlled barriers than are either tropics or Arctic-subarctic, and thus more endemism has developed. For example, the warm-temperate eastern Pacific is isolated from warm-temperate Japan by a deep water barrier of great magnitude and from warm-temperate Europe by a continent and an ocean. On the other hand the warm-tropic waters form a continuous band from Africa through Indonesia to Panama but warm-temperate waters are barred from continuity by continents. Cold Arctic and subarctic waters are relatively continuous.

TABLE 3.—*Dominant amphipod genera in the Tropics, with number of species in Tropics, Arctic-subarctic, and remaining world areas*

Genera	Tropical	Arctic-subarctic	Remainder
Elasmopus	21	2	10
Eurystheus	8	2	44
Hyale	9	4	30
Lembos	10	3	14
Leucothoe (inquilinous)	8	2	10
Maera	14	5	15
Photis	9	5	20
Podocerus	8	0	11

COLLECTING LOCALITIES.—Eniwetok and Ifaluk Atolls have gone under various names. Equivalent names for Eniwetok appear on chart 6 by Emery, Tracey and Ladd (1954), in a list by Dawson (1957), and on an insert map issued by the Eniwetok Marine Biological Laboratory (EMBL). Those for Ifaluk appear in Tracey, Abbott and Arnow (1961), which contains the only adequate charts of that atoll. Equivalent names are listed below. The names chosen by Dawson (1957) and by Tracey, Abbott and Arnow (1961) are used in the present paper.

ENIWETOK ATOLL

Dawson (1957)	Emery et al. (1954)	EMBL Map
Bogombogo	Bogombogo	Belle
Engebi	Engebi	Janet
Aaraanbiru	Arambiru	Vera
Aniyaanii	Japtan	Bruce
Japtan	Muti	David
Bogen	Bogen	Rex
Parry	Parry	Elmer
Eniwetok	Eniwetok	Fred
Igurin	Igurin	Glenn
Rigili	Rigili	Leroy

IFALUK ATOLL

Tracey et al. (1961)	Board of Geographic Names
Ifaluk Atoll	Ifalik Atoll [sic]
Falarik Island	Ifalik Island
Falalap Island	Flalap Island [sic]
Ella Island	Ella Island
Elangalap Island	Moai Island

Station List

Ifaluk Atoll

Collected by Dr. D. P. Abbott, 1953

13–C–1, wash of corallines and corals, upper 30 ft. of zone of spurs and grooves outside algal ridge, reef east of the south end of Falarik Islet, Aug. 25.
Elasmopus spinidactylus, 8; *Eurystheus digitatus*, 1

14–B–3, wash of *Porolithon*, same data as 13–C–1.
Elasmopus spinidactylus, 14; *Eurytheus digitatus*, 11

15–C–2, wash of coral *Pocillopora* and alga *Halimeda*, same data as 13–C–1.
Eurystheus ?digitatus, 2

18–E–4, wash of corallines and other algae, same data as 13–C–1.
Elasmopus spinidactylus, 1

19–E–3, wash of corallines and other algae, same data as 13–C–1.
Cymadusa filosa, 1; *Eurystheus aigitatus*, 3

22–D–5, algal ridge on reef east of south end of Falarik Islet, intertidal, Sept. 4.
Maera insignis, 6

23–E–2, wash of algae and rock fragments, same data as 22–D–5.
Cymadusa filosa, 1; *Elasmopus atolgidus*, new species, 1; *Maera insignis*, 1

24–C–1, wash of rocks bearing corallines and other algae, same data as 22–D–5.
Elasmopus spinidactylus, 9; *Maera insignis*, 4

26–F–2, wash from algae, same data as 22–D–5.
Maera insignis, 6

27–F–1, wash of corallines and other algae, same data as 22–D–5.
Maera insignis, 4

28–D–3, wash from algae, same data as 22–D–5.
Elasmopus ?pseudaffinis, 2; *Eurystheus digitatus*, 5; *Maera insignis*, 2

29–C–1, wash from algae, same data as 22–D–5.
Elasmopus spinidactylus, 3; *Maera insignis*, 3

30–C–4, wash from algae, same data as 22–D–5.
Elasmopus pseudaffinis, 2; *Maera insignis*, 5

31–D–2, wash from algae, same data as 22–D–5.
Eurystheus digitatus, 1; *Lembos intermedius*, 1; *Maera insignis*, 10; *Maera othonopsis*, 1; *Microdeutopus tridens*, 2; *Ronco sosa*, new genus, new species, 1

32–G–3, wash from algae, same data as 22–D–5.
Eurystheus digitatus, 2; *Lembos* species (near *francanni*), 1; *Maera insignis*, 7; *Microdeutopus tridens*, 1

39–E–5, wash from algae, floor of outermost quarter of outer reef flat, reef east of the south end of Falarik Islet, covered by a few inches of water even at the lowest tides, Sept. 17.
Elasmopus pseudaffinis, 3; *Eurystheus digitatus*, 3; *Maera insignis*, 2; *Podocerus talegus*, new species, 1

40–E–3, wash from algae, same data as 39–E–5.
Maera inaequipes serrata, 1; *Maera insignis*, 16; *Microdeutopus tridens*, 1

41–D–3, wash from algae, same data as 39–E–5.
Azotostoma fusta, new genus, new species, 2; *Eurystheus digitatus*, 1; *Leucothoides pottsi*, 1; *Maera insignis*, 21; *Microdeutopus tridens*, 2; *Podocerus talegus*, new species, 3

42–F–2, wash from algae, same data as 39–E–5.
Azotostoma fusta, new genus, new species, 2; *Cymadusa ?filosa*, 2; *Elasmopus rapax*, 2; *Eurystheus ?digitatus*, 2; *Maera inaequipes serrata*, 2; *Maera insignis*, 15; *Microdeutopus tridens*, 1

44–D–3, wash from algae, same data as 39–E–5.
Maera insignis, 3

46–E–2, wash from algae, from floor of innermost third of outer reef flat, reef east of the south end of Falarik Islet, exposed by lowest tides, Sept. 17.
Azotostoma fusta, new genus, new species, 1; *Eurystheus ?digitatus* 2; *Maera insignis*, 7

48–E–1, wash from algae, same data as 46–E–2.
Maera insignis, 13

49–E–2, wash from algae and sponges, same data as 46–E–2.
Eurystheus ?digitatus, 2; *Maera insignis*, 10; *Maera pacifica*, 4

50–E–1, wash from algae, same data as 46–E–2.
Leucothoe tridens, 1; *Maera insignis*, 17

51–C–2, from rocks bearing algae, boulder flat forming the inner reef flat, reef west of Elangalap Islet, intertidal, Sept. 20.
Parhyale hawaiensis, 4

53–B–3, wash from rock bearing alga, *Cladophoropsis*, same data as 51–C–2.
Parhyale hawaiensis, 3

55–C–3, wash from algae on dead coral rocks, from boulder flat, lagoon shelf adjacent to shore, east side of Elangalap Islet, intertidal and upper subtidal, Sept. 20.
Parhyale hawaiensis, 5

57–E–2, wash from algae and corals, *Heliopora* heads of lagoonward reef margin, reef between Ella and Elangalap Islets, depth 2–6 feet, Sept. 20.
Elasmopus pseudaffinis, 1

58–F–2, wash from algae, same data as 57–E–2.
Azotostoma fusta, new genus, new species, 1; *Elasmopus pseudaffinis*, 3

60–D–1, wash from algae, same data as 57–E–2.
Elasmopus pseudaffinis, 1

66–E–10, wash from algae and corals, algal ridge, 20 yards in from breaker line, western reef between Elangalap Islet and north end of Falarik Islet, intertidal, Sept. 21.
Azotostoma fusta, new genus, new species, 1; *Elasmopus pseudaffinis*, 3; *Eurystheus digitatus*, 3; *Maera insignis*, 3

69–E–7, wash from algae and *Tubipora*, same data as 66–E–10.
Maera insignis, 1

70–C–3, wash from algae and *Tubipora*, same data as 66–E–10.
Elasmopus pseudaffinis, 1

72–G–3, wash from algae and corals, inner reef flat, about halfway between breakers and lagoonward reef margin, western reef between Elangalap Islet and the north end of Falarik Islet, depth, about 6 inches at low tide, Sept. 21.
Elasmopus pseudaffinis, 2; *Eurystheus ?pacificus*, 2; *Maera inaequipes*, 3

76–H–3, wash from algae, inner reef flat about two thirds of the way inward from breaker line toward lagoonward reef margin, western reef between Elangalap Islet and north end of Falarik Islet, depth, about 6 inches at low tide, Sept. 21.
Cymadusa filosa, 1; *Elasmopus pseudaffinis*, 1; *Lembos intermedius*, 3; *Maera inaequipes serrata*, 1

81–B–4d, wash from alga *Microdictyon*, patch reef on lagoon shelf west of the southwest end of Falarik Islet, 3 fathoms, Sept. 28.

768–792—65——2

Maera inaequipes serrata, 2; *Microdeutopus tridens*, 4; *Parelasmopus resacus*, new species, 17

83–E–1, wash from algae, old elevated reef remnant at junction of outer and inner reef flats, reef east of the south end of Falarik Islet, intertidal, Sept. 29.
Cymadusa filosa, 1; *Elasmopus pseudaffinis*, 3; *Eurystheus ?digitatus*, 2; *Maera insignis*, 3; *Maera ?pacifica*, 7; *Parhyale hawaiensis*, 1

84–D–1, wash from algae, inner reef flat, about 130 feet from shore, reef east of the south end of Falarik Islet, intertidal, Sept. 29.
Cymadusa filosa, 8; *Elasmopus pseudaffinis*, 2; *Maera ?pacifica*, 2

85–F–3, wash from algae, about 100 feet from shore, same data as 84–D–1.
Elasmopus pseudaffinis, 2; *Maera ?pacifica*, 1

87–H–2, wash from algae, 70 feet from shore, same data as 84–D–1.
Elasmopus brasiliensis, 7

89–F–3, wash from algae, about 35 feet from shore, same data as 84–D–1.
Elasmopus brasiliensis, 11

90–C–4, wash from algae, about 35 feet from shore, same data as 84–D–1.
Cymadusa filosa, 2; *Elasmopus excavatus*, 1

91–E–2, wash from algae, almost at shoreline, same data as 84–D–1.
Cymadusa filosa, 4; *Maera insignis*, 1; *Maera ?pacifica*, 10; *Parhyale hawaiensis*, 11

95–D–4, wash from algae, inner reef flat 375–450 feet in from breaker line, reef north of northwest end of Falarik Islet, intertidal, Oct. 2.
Elasmopus pseudaffinis, 2

95–L–4, wash from algae, 450–550 feet in from breaker line, same data as 95–D–4.
Cymadusa filosa, 2; *Elasmopus brasiliensis* 2; *Elasmopus pseudaffinis*, 1

95–O–4, wash from algae, 600 feet in from breaker line, same data as 95–D–4.
Elasmopus brasiliensis, 3; *Maera pacifica*, 1

99–F–3, wash from algae *Halimeda*, lagoon bottom a very large sandy knoll covered with *Halimeda*, depth 36 feet, Oct. 3.
Leucothoella bannwarthi, 2

102–B–2, wash from algae and corallines on dead coral branches, depth 33 feet on patch reef on bottom near center of lagoon, Oct. 3.
Azotostoma fusta, new genus, new species, 1; *Parelasmopus resacus*, new species, 6

112–I–5, from turtle grass beds, lagoon shelf near shore, lagoon west of Katelu area of sourthwest Falarik Islet, depth 0–2 feet, Oct. 7–8.
Cymadusa filosa, 1; *Maera pacifica*, 1; *Microdeutopus tridens*, 1

113–H–2, same data as 112–I–5, Oct. 8–9.
Colomastix pusilla, 2; *Cymadusa filosa*, 1; *Leucothoella bannwarthi*, 2; *Maera inaequipes serrata*, 27; *Microdeutopus tridens*, 10

116–F–3, same data as 112–I–5, Oct. 8–9.
Colomastix pusilla, 1; *Cymadusa filosa*, 1; *Lembos* species (near *francanni*), 5; *Leucothoella bannwarthi*, 1; *Maera inaequipes serrata*, 2

122–C–1, wash from algae on *Tubipora* colony, bottom of ship pass between Ella and Falalap Islets, depth 2.5 fathoms, Oct. 18.
Azotostoma fusta, new genus, new species, 1; *Colomastix pusilla*, 1; *Leucothoe micronesiae*, 2

123–D–2, wash from alga *Liagora*, zone of spurs and grooves outside west tip of Falielang, near ship pass, depth 1 fathom, Oct. 18.
Cymadusa filosa, 7; *Liagoceradocus pusillus*, new genus, new species, 2

124–D–3, wash from *Halimeda* rooted in sand, lagoon shelf on west side of lagoon between Elangalap Islet and the northwest end of Falarik Islet, depth 9 feet, Oct. 19.

Dexaminoides orientalis, 1; *Lembos intermedius*, 2

125–D–3, wash from algae growing on dead *Heliopora*, lagoonward reef margin western reef between Elangalap Islet and northwest end of Falarik Islet, depth 1–6 feet, Oct. 19.

Dexaminoides orientalis, 3; *Elasmopus pseudaffinis*, 1; *Maera inaequipes serrata*, 2

126–C–4, wash from algae, same data as 125–D–3.

Maera inaequipes serrata, 1; *Microdeutopus tridens*, 3

128–C–5, wash from algae, same data as 125–D–3.

Elasmopus pseudaffinis, 2; *Lembos* species (near *francanni*), 1; *Lembos intermedius*, 1; *Maera insignis*, 1.

130–C–2, wash from algae, same data as 125–D–3.

Elasmopus pseudaffinis, 4

132–E–4, from dead coral head, lying on edge of lagoon shelf, sandy bottom, between Elangalap Islet and north end of Falarik Islet, depth 12 feet, Oct. 19.

Elasmopus pseudaffinis, 1; *Microdeutopus tridens*, 1

136–C–4, wash from *Halimeda*, lagoonward reef margin, western reef between Elangalap Islet and north tip of Falarik Islet, depth 1 fathom, Oct. 20.

Microdeutopus tridens, 1

137–E–6, wash from *Halimeda*, same data as 136–C–4.

Microdeutopus tridens, 9

138–E–4, wash from algae, same data as 136–C–4.

Microdeutopus tridens, 4.

139–C–2, wash from corallines and other algae, west reef between Elangalap Islet and north tip of Falarik Islet, depth 6 inches to 3 feet, Oct. 20.

Cymadusa filosa, 1; *Elasmopus pseudaffinis*, 7.

141–D–3, wash from algae, lagoonward reef margin, depth 1 fathom, same data as 139–C–2.

Elasmopus pseudaffinis, 1; *Maera inaequipes serrata*, 1; *Maera quadrimana*, 1; *Microdeutopus tridens*, 2; *Parelasmopus albidus*, 1; *Pleonexes* species, 1

142–E–4, wash from algae, same data as 141–D–3.

Elasmopus pseudaffinis, 6; *Maera inaequipes serrata*, 1

144–F–2, wash from algae, patch reef on lagoon shelf, 75 feet from shore, off Katelu area of southwest Falarik Islet, depth 1–3 feet, Oct. 21.

Cymadusa filosa, 2; *Maera inaequipes serrata*, 1

145–C–2, wash from algae growing on dead coral, same data as 144–F–2.

Anamixis falarikia, new species, 1; *Anamixis stebbingi*, 1

145–C–3, wash from algae on dead coral, same data as 144–F–2.

Cymadusa filosa, 5; *Parelasmopus resacus*, new species, 2

146–151–H–4, wash from coral fragments covered with algae, 50–100 feet from shore, depth 0–4 feet, same data as 144–F–2, Oct. 22.

Elasmopus pseudaffinis, 2; *Microdeutopus tridens*, 1

152–D–3, depth 2–6 feet, same data as 146–151–H–4.

Parelasmopus resacus, 2

155–157–G–1, wash from algae, southwestern reef between Elangalap and Ella Islets, depth 1 fathom, Oct. 23.

Elasmopus pseudaffinis, 5; *Eurystheus pacificus*, 1; *Leucothoe micronesiae*, new species, 3; *Microdeutopus tridens*, 2

158–159–D–5, wash from algae growing in sand, lagoon shelf north of center of Ella Islet, depth 2 fathoms, Oct. 24.

Elasmopus pseudaffinis, 1; *Leucothoides pottsi*, 1; *Microdeutopus tridens*, 7

160–165–J–5, wash from algae and rocks, about 700 feet west of west shore of Elangalap Islet, depth 25–35 feet, Oct. 25.

Megamphopus abbotti, new species, 1; *Eurystheus pacificus*, 1; *Lembos ?intermedius*, 1; *Leucothoe tridens*, 1; *Leucothoides pottsi*, 1; *Maera inaequipes*, 1; *Ronco sosa*, new genus, new species, 1

166–G–3, from shell of *Tridacna squamosa*, same data as 160–165–J–5.

Megamphopus abbotti, new species, 6

167–D–4, wash from *Halimeda*, from bottom of ship pass between Falalap and Ella Islets, depth 13–14 feet, Oct. 25.

Microdeutopus tridens, 3

176–G–4, from turtle grass and *Halimeda* beds, lagoon shelf off southwest tip of Falarik Islet, barely exposed at low tide, Oct. 27.

Lembos intermedius, 3; *Microdeutopus tridens*, 4

177–G–5, same data as 176–G–4.

Anamixis stebbingi, 1; *Cymadusa filosa*, 7; *Lembos intermedius*, 2; *Leucothoe micronesiae*, new species, 1; *Leucothoides pottsi*, 2; *Microdeutopus tridens*, 8

179–184–M–1, wash from algae, lagoon shelf beyond turtle grass beds, west of north end of Falalap Islet, depth 3–6 feet, Oct. 27.

Cymadusa filosa, 11; *Lembos intermedius*, 3; *Leucothoe micronesiae*, new species, 2; *Maera inaequipes serrata*, 3; *Microdeutopus tridens*, 35

192–D–6, wash from algae and dead coral, patch reef off Katelu area of southwest Falarik Islet, about 30 feet from lagoon shore, depth 1–3 feet, Oct. 29.

Cymadusa filosa, 1; *Microdeutopus tridens*, 2

194–E–2, plankton haul, surface of open lagoon, 2100–2300 hours, Oct. 10.

Synopia variabilis, 2

197–198–F–1, wash from rocks bearing *Cladophoropsis*, reef east of the east end of channel separating Falarik and Falalap Islets, intertidal, Oct. 31.

Eurystheus pacificus, 1; *Parhyale hawaiensis*, 25

208–C–7, wash from algae, from spurs and grooves, southwest reef between Ella and Elangalap Islets, depth 4–20 feet, Sept. 30.

Podocerus talegus, new species, 7

209–F–4, wash from algae dredged from large sandy knoll covered with *Halimeda*, depth 36 feet, Oct. 3.

Colomastix pusilla, 1

Collected by Dr. F. M. Bayer, Fourth Pacific Atoll Survey Team, Pacific Science Board, 1953

431, north end of Falarik, crustaceans from clump of *Pocillopora* on seaward reef edge, Oct. 1.

Maera insignis, 9; *Maera ?pacifica*, 1; *Podocerus talegus*, new species, 1

465, sponge and associated invertebrates from lagoon station C, 47.5 feet, Oct. 3.

Anamixis falarikia, new species, 1; *Leucothoides pottsi*, 1

467, sponge and associates, same data as 465.

Colomastix pusilla, 9; *Leucothoe micronesiae*, new species, 8; *Leucothoides pottsi*, 1

588, sand samples for foraminifers, seaward reef about middle of second 20 foot interval from reef margin, Falarik, Oct. 16.

Cymadusa filosa, 1

589, same data as 588, third 20 foot interval from reef margin.
Maera ?insignis, 1; *Podocerus talegus*, new species, 1
592, same data as 588, seventeenth 20-foot interval from reef margin.
Microdeutopus tridens, 1
594, sponges from coral rock, lagoon near the pass, Oct. 7.
Colomastix pusilla, 4; *Leucothoides pottsi*, 3
620, probably mislabeled sample of *Talorchestia spinipalma* from strand, labeled as from submerged coral knoll.
628, *Haminoea* and egg masses from *Thalassia* beds north of Katelu Benjo, lagoon shore at south end of Falarik, Oct. 9.
Cymadusa brevidactyla, 2
638, animals from crevices in *Porolithon* beds, seaward reef margin, middle of Falarik, Oct. 17.
Ronco sosa, new genus, new species, 1
670, orange sponge, lagoon off middle of Ella in 2–2.5 fathoms, Oct. 20.
Colomastix pusilla, 1
709, black sponge common on reefs, and white sponge which permeates interstices of coral heads, heliopore zone south of Elangalap, Oct. 23.
Colomastix pusilla, 3
754, sponge from flats on lagoon side north of Falalap, Oct. 27.
Microdeutopus tridens, 1
756, hydroids from clump of *Seriatopora* in ships pass 5–5.5 fathoms, Oct. 28.
Colomastix pusilla, 5; *Elasmopus pseudaffinis*, 1.
800, organisms from beneath boulders of elang on seaward reef at south end of Falarik, Oct. 31.
Parhyale hawaiensis, 1
821, erroneous label for *Talorchestia spinipalma*, sandhoppers.

Kapingamarangi Atoll

Collected by Dr. Cadet Hand, 1954

CH–551, rill zone, edge of algal mat, from coral, Hare, Aug. 4.
Ampithoe ?ramondi, 1
CH–609, ocean beach, Hare, Aug. 6.
Parhyale hawaiensis, 6
CH–682, coral head, Sokoro, Aug. 9.
Elasmopus pseudaffinis, 1

Eniwetok, Bikini, and Majuro Atolls

Collected by Dr. D. J. Reish, August, September 1956

E–2, Parry Island, ocean side, in front of EMBL, outer reef flat, algal holdfasts and clumps of sand, Aug. 20.
Cymadusa filosa, 1; *Elasmopus pseudaffinis*, 1
E–6, Rigili Island, ocean side, formalin washings from brown staghorn coral, Aug. 21.
Ampithoe ramondi, 3; *Cymadusa filosa*, 2; *Paragrubia vorax*, 3
E–13, Rigili Island, lagoon side, pieces of corals broken and washed in formalin, Aug. 21.
Ampithoe ramondi, 1

E–15, Parry Island, ocean side, in front of AEC quarters, inner reef flat, algal clumps with sand, Aug. 22.
Cymadusa filosa, 1

E–18, Parry Island, ocean side, in front of EMBL, surge zone, in clumps of alga, *Cladophora* species, Aug. 22.
Elasmopus pseudaffinis, 8

E–20, Parry Island, lagoon side, near EMBL, brown alga, *Chnoospora implex* Hering *ex* J. Agardh, attached to rocks just below water level, Aug. 23.
Ampithoe cf. *ramondi*, 2; *Eurystheus digitatus*, 1; *Paragrubia vorax*, 8

E–21, Aniyaanii Island, lagoon side, middle of island, cemented coral sand rock, Aug. 24.
Hyale honoluluensis, 1

E–24, Aniyaanii Island, lagoon side, middle of island, formalin washings of coral head, Aug. 24.
Ampithoe ramondi, 6; *Elasmopus rapax*, 3; *Eurystheus digitatus*, 4; *Microdeutopus tridens*, 1

E–25, Aniyaanii Island, ocean side, middle of island, reef flat alga, *Turbinaria ornata* (Turner), Aug. 24.
Cymadusa filosa, 5

E–26, Aniyaanii Island, ocean side, middle of island, corallina alga, *Porolithon ?oncodes*, from near surge zone, Aug. 24.
Ampithoe ramondi, 6; *Elasmopus pseudaffinis*, 2; *Elasmopus spinidactylus*, 5

E–27, Aniyaanii Island, ocean side, middle of island, reef flat, coral rock, Aug. 24.
Elasmopus pseudaffinis, 1

E–28, Aniyaanii Island, ocean side, middle of island, scrapings from undersurface of rock, Aug. 24.
Eurystheus digitatus, 1; *Maera inaequipes serrata*, 1

E–32, Aniyaanii Island, lagoon side at small boat dock, fouling organisms attached to pilings, Aug. 25.
Elasmopus pectenicrus, 10

E–38, Igurin Island, lagoon side, algae attached to rocks, Aug. 27.
Cymadusa filosa, 41; *Eurystheus digitatus*, 1; *Elasmopus pseudaffinis*, 1; *Hyale honoluluensis*, 5; *Paragrubia vorax*, 1

E–40, Igurin Island, lagoon side, alga, *Bryopsis* species, attached to rocks, Aug. 27.
Cymadusa filosa, 5; *Elasmopus pseudaffinis*, 1; *Eurystheus digitatus*, 1; *Lembos aequimanus*, 1; *Lembos bryopsis*, new species, 1; *Maera hamigera*, 7; *Maera inaequipes serrata*, 6

E–41, Igurin Island, lagoon side, preserved rocks, Aug. 27.
Cymadusa filosa, 1; *Eurystheus digitatus*, 1; *Eurystheus pacificus*, 2; *Maera hamigera*, 1

E–42, Igurin Island, lagoon side, sand washings from under rocks, Aug. 27.
Cymadusa filosa, 2; *Maera hamigera*, 5; *Maera inaequipes serrata*, 1

E–43, Igurin Island, ocean side, surge zone, coralline alga, *Halimeda macrophysa* Askenasy, Aug. 27.
Elasmopus pseudaffinis, 1; *Maera hamigera*, 3; *Maera othonopsis*, 1; *Paragrubia vorax*, 2

E–44, Igurin Island, ocean side, coralline alga, *Porolithon ?oncodes*, Aug. 27.
Ampithoe ramondi, 1; *Elasmopus pseudaffinis*, 2; *Maera inaequipes*, 7

E–45, Igurin Island, ocean side, rocky coral material taken from under coral head near surge zone, Aug. 27.
Megamphopus abbotti, new species, 1; *Eurystheus atlanticus*, 1

E–48, Japtan Island, ocean side, *Ectocarpus breviarticulatus* J. Agardh, alga growing in tide pools in reef flat area, Aug. 28.
Cymadusa filosa, 2

E–49, Japtan Island, ocean side, undersurface of old coral head in reef flat, Aug. 28.
Lembos aequimanus, 1

E–50, Japtan Island, lagoon side, algae growing to swimming float, Aug. 28.
Cymadusa filosa, 2; *Hyale honoluluensis*, 4

E–52, Parry Island, lagoon side at barge dock near EMBL, night light, over water 15 feet deep, sandy bottom, surface swimmers, Aug. 28.
Synopia variabilis, 12

E–53, Rigili Island, ocean side, old coral heads, coral rocks, Aug. 29.
Maera pacifica, 9

E–55, Rigili Island, lagoon side, alga *Boodlea composita* (Harv) Brand, Aug. 29.
Cymadusa filosa, 4; *Paragrubia vorax*, 2

ME–56, Majuro Atoll, Ulika Island, ocean side near hotel, under surface of rocks, small tidepool on reef flat, Aug. 30.
Elasmopus pseudaffinis, 1

ME–57, Majuro Atoll, Ulika Island, ocean side near hotel, algae mixed with sand attached to rocks on inner portion of reef flat, Aug. 30.
Cymadusa filosa, 1; *Elasmopus pseudaffinis*, 2

ME–60, Majuro Atoll, Ulika Island, ocean side near hotel, coarse sand with a little algae from inner reef flat, Aug. 30.
Cymadusa filosa, 7

ME–62, Majuro Atoll, Ulika Island, ocean side near hotel, rocks from inner reef flat area, Aug. 30.
Parhyale hawaiensis, 4

E–68, Parry Island, ocean side near EMBL, algae growing on reef flat area near surge zone, Sept. 2.
Elasmopus pseudaffinis, 1; *Eurystheus digitatus*, 1; *Hyale honoluluensis*, 16

E–72, Aaraanbiru Island, ocean side, coralline algae (rocks) from surge zone (*Porolithon ?oncodes*), Sept. 4.
Ampithoe ramondi, 6; *Hyale dentifera*, 5

E–73, Aaraanbiru Island, ocean side, algae, *Porolithon* species, Sept. 4.
Elasmopus spinidactylus, 13; *Hyale dentifera*, 2; *Hyale media*, 4

E–74, Aaraanbiru Island, ocean side, *Turbinaria ornata*, alga growing near surge zone, Sept. 4.
cf. *Ampithoe ramondi*, 3; *Hyale chevreuxi*, 11

E–75, Aaraanbiru Island, ocean side, rocks at surge zone, Sept. 4.
Cymadusa filosa, 4; *Elasmopus ?pseudaffinis*, 6; *Maera ?insignis*, 1; *Maera quadrimana*, 1

E–76, Aaraanbiru Island, ocean side, *Halimeda gigas* Taylor, alga from surge zone, Sept. 4.
Elasmopus spinidactylus, 1; *Paragrubia vorax*, 1

E–77, Aaraanbiru Island, ocean side, *Porolithon* species, coralline alga rock from surge zone, Sept. 4.
Elasmopus spinidactylus, 10; *Hyale media*, 4; *Maera quadrimana*, 5

E–78, Aaraanbiru Island, ocean side, coral head from surge zone, Sept. 4.
Elasmopus pseudaffinis, 5

E–81, Aaraanbiru Island, lagoon side, algae attached to rocks, Sept. 4.
Cymadusa filosa, 6

E–82, Aaraanbiru Island, lagoon side, coral rock and cemented coarse coral sand rock with algae attached, Sept. 4.
Ampithoe ramondi, 8; *Cymadusa filosa*, 2

E–83, Aaraanbiru Island, ocean side, algae and red sponge attached to reef flat, Sept. 4.
cf. *Maera insignis*, 1; *Paragrubia vorax*, 14

E–85, Aaraanbiru Island, ocean side, algae attached to reef flat, Sept. 4.
Maera inaequipes serrata, 1; *Maera quadrimana*, 9; *Paragrubia vorax*, 1

E–86, Aaraanbiru Island, ocean side, reef flat, coral rock with algae attached, Sept. 4.
Elasmopus pseudaffinis, 1

E–88, Aaraanbiru Island, ocean side, algae attached to reef flat, Sept. 4.
Maera quadrimana, 17

E–93, Eniwetok Island, ocean side, *Caulerpa racemosa* var. *peltata* (Lamx.) Eubank forma, algae from surge zone, Sept. 5.
Elasmopus pseudaffinis, 15; *Elasmopus spinidactylus*, 8; *Eurystheus digitatus*, 4; *Hyale honoluluensis*, 10; *Paragrubia vorax*, 3

E–94, Eniwetok Island, ocean side, *Chnoospora implexa*, alga from surge zone, Sept. 5.
cf. *Ampithoe ramondi*, 2; *Elasmopus spinidactylus*, 11; *Hyale media*, 8

E–95, Eniwetok Island, ocean side, *Porolithon* species, coralline algae rocks from surge zone, Sept. 5.
Cymadusa filosa, 2; *Elasmopus spinidactylus*, 6

E–96, Eniwetok Island, ocean side, *Porolithon* species, old coralline algae rocks, some algae, Sept. 5.
Elasmopus pseudaffinis, 1; *Elasmopus spinidactylus*, 1; *Eurystheus digitatus*, 1

BE–100, Bikini Atoll, Enyu Island, ocean side, *Porolithon ?oncodes*, coralline algal rocks, Sept. 6.
Elasmopus pseudaffinis, 3

BE–101, Bikini Atoll, Enyu Islands, ocean side, *Porolithon* species, coralline algal rock from surge zone, Sept. 6.
Elasmopus spinidactylus, 35; *Hyale dentifera*, 1; *Hyale honoluluensis*, 10; *Hyale media*, 22

BE–102, Bikini Atoll, Enyu Island, ocean side, *Caulerpa racemosa*, algae from pot holes in surge zone, Sept. 6.
Elasmopus pseudaffinis, 5; *Hyale chevreuxi*, 8

BE–103, Bikini Atoll, Enyu Island, ocean side, *Codium* species algae from surge zone, Sept. 6.
Ampithoe ramondi, 2; *Elasmopus pseudaffinis*, 6

BE–104, Bikini Atoll, Enyu Island, ocean side, reef flat near surge zone, Sept. 6.
Ampithoe ramondi, 1; *Elasmopus pseudaffinis*, 4; *Lembos aequimanus*, 1

BE–107, Bikini Atoll, Enyu Island, *Halimeda opuntia*, algae from tide pool in middle of reef flat area, Sept. 6.
Elasmopus pseudaffinis, 4; *Paragrubia vorax*, 2

BE–108, Bikini, Enyu Island, ocean side, old *Porolithon* species and coarse coral sand and cemented rock from reef flat, Sept. 6.
Elasmopus spinidactylus, 2

BE–109, Bikini, Enyu Island, ocean side, many species of algae attached to rocks on reef flat, forming a mat, Sept. 6.
Cymadusa filosa, 7; *Elasmopus ?pseudaffinis*, 1

BE–111, Bikini, Enyu Island, lagoon side, *Halimeda opuntia*, algae attached to large rock, Sept. 6.
Elasmopus pseudaffinis, 38

BE–112, Bikini, Enyu Island, lagoon side, cemented coral sand rock, Sept. 6.
Elasmopus spinidactylus, 20

BE–113, Bikini, Enyu Island, lagoon side, rocks of cemented coral sand, Sept. 6.
Elasmopus spinidactylus, 21

BE–114, Bikini, Enyu Island, ocean side, inner reef flat, sand under small rocks, some algae, Sept. 6.
Cymadusa filosa, 6

E–116, Engebi Island, ocean side, *Turbinaria ornata* algae attached to rocks at surge zone, Sept. 7.
Ampithoe ramondi, 1; *Hyale honoluluensis*, 8

E–118, Engebi Island, ocean side, algae on rocks at surge zone, Sept. 7.
Hyale honoluluensis, 9

E–119, Engebi Island, ocean side, rocks mixed with algae from surge zone, Sept. 7.
Cymadusa filosa, 1; *Elasmopus ?pseudaffinis*, 3

E–120, Engebi Island, ocean side, algae on surface of outer reef flat, Sept. 7.
Beaudettia palmeri, new genus, new species, 3; *Cymadusa filosa*, 1; *Paragrubia vorax*, 2

E–127, Engebi Island, lagoon side, algae and sand, Sept. 7.
Ampithoe ramondi, 10; *Elasmopus pseudaffinis*, 4

E–128, Engebi Island, lagoon side, coral rocks resting in sand, Sept. 7.
Ampithoe ramondi, 11; *Cymadusa filosa*, 1; *Elasmopus spinidactylus*, 6

E–129, Engebi Island, lagoon side, algae attached to rocks in tide pool, Sept. 7.
Ampithoe ramondi, 1; *Cymadusa filosa*, 4; *Elasmopus pseudaffinis*, 5

E–133, Aaraanbiru Island, lagoon side, sand from 5 feet of water, Sept. 11.
Lembos species (cf. *L. francanni*), 1

E–136, Bogen Island, channel side, algae attached to old coral heads in 5 feet of water, Sept. 12.
Cymadusa filosa, 4; *Elasmopus pseudaffinis*, 3; *Paragrubia vorax*, 1

E–137, Bogen Island, ocean side, algae *Caulerpa racemosa*, Sept. 12.
Elasmopus pseudaffinis, 8; *Eurystheus digitatus*, 4; *Maera hamigera*, 1; *Maera inaequipes serrata*, 1; *Maera insignis*, 4

E–138, Bogen Island, ocean side, cemented coarse coral sand, Sept. 12.
Maera ?insignis, 1

E–140, Bogen Island, ocean side, rocks, cemented coral sand rock, Sept. 12.
Elasmopus pseudaffinis, 1; *Hyale honoluluensis*, 7

E–142, Bogen Island, channel side, old coral heads in 5 feet of water, Sept. 12.
Elasmopus pseudaffinis, 1; *Eurystheus atlanticus*, 10

E–143, Parry Island, sediment bucket suspended for 22 days, collected Sept. 14.
cf. *Ampithoe ramondi*, 5

E–144, same as E–143, fouling organisms from wood block.
Ampithoe ramondi, 24

E–145, same as E–144, organisms from sediments in bucket.
Ampithoe ramondi, 9

June and July 1957

E–147, Parry Island, lagoon side by power plant, sand and worm tubes from 10 feet of water, June 29.
Leucothoe hyhelia, new species, 4

E–158, Parry Island, at small island toward Eniwetok Island, lagoon sand from 10–15 feet of water, June 30.
Leucothoe hyhelia, new species, 5

E–163, Bogombogo Island, ocean side, wash of old coral heads in about 1 foot of water, July 2.
Cymadusa filosa, 1; cf. *Lembos intermedius*, 1; *Maera hamigera*, 2

E–166, Bogombogo Island, ocean side, algal clumps in 1 foot of water, July 2.
cf. *Maera inaequipes serrata*, 1

E–169, Bogombogo Island, ocean side, intertidal sand, July 2.
Lembos species (cf. *francanni*), 1

E–171, Bogombogo Island, lagoon side, algae attached to old coral heads, July 2.
?*Ampithoe ramondi*, 14; *Cymadusa filosa*, 4; *Hyale honoluluensis*, 4

E–172, Bogombogo Island, lagoon side, old coral head washings and coral rock, July 2.
Ampithoe ramondi, 5; *Cymadusa filosa*, 8; *Lembos* species (cf. *francanni*), 3

E–182, Parry Island, lagoon opposite EMBL, coral washings, July 7.
Synopia variabilis, 1

E–184, Parry Island, lagoon opposite EMBL, old coral washings from 5 feet of water, July 8.
?*Ampithoe ramondi*, 4; *Elasmopus pseudaffinis*, 5

Family Lysianassidae

Azotostoma, new genus

Diagnosis: Mouthparts styliform, formed into a large ventral conical bundle; basal article of mandibular palp nearly as long as second article; lower lip with well defined mandibular processes, inner lobes absent; maxilla 1 with projecting but blunt inner plate, fringed apically with fine hairs, outer plate with about 7 or 8 distal teeth, palp apparently biarticulate, clavo-falciform, exceeding outer plate; maxilla 2 with both pairs together enclosing an imaginary hemispherical channel, inner plate medially expanded, hairy, outer plate much more slender; maxilliped with palp projecting only slightly beyond the large outer plate, inner plates styliform, reaching end of outer plate, palp with 4 articles, the second produced apically so that the third article is attached proximal to its apex, article 4 claw-shaped; gnathopod 1 simple, not subchelate, the sixth and seventh articles quite elongated and slender, article 7 serrate along its inner edge; gnathopod 2 minutely subchelate; coxae closely packed but first not strongly concealed by second; uropod 3 biramous; telson entire.

Type species: *Azotostoma fusta*, new species.

Relationship: This genus belongs with the *Trischizostoma-Acidostoma* group of lysianassids bearing styliform mouthparts formed into a concial bundle. The genus differs from *Stomacontion* and *Acontiostoma* by the biramous third uropods; from *Phoxostoma* by the well-developed fourth article of the maxillipedal palp; from *Trischizostoma* by the simple, styliform first gnathopod; from *Acidostoma* by the large palp of maxilla 1 and from *Shackletonia*, to which it bears closest relationship, by the uncleft telson. The genus assorts so many unusual features that it is not closely related to any other genus of lysianassid mentioned and is quite remarkable in the second maxillae and in the produced second article of the maxillipedal palp.

***Azotostoma fusta*, new species**

FIGURES 1, 2

Diagnosis: With the characters of the genus.

Notes: Third uropod with peduncle formed into a slight lateral plate; sixth article of gnathopod 2 with 4 large curved, bifurcate setae; eye large, dark, ommatidia quite large for the small head; pleonal epimera with quadrate lower posterior corners; urosomal segments strongly telescoped.

Holotype: USNM 106797, female, 2.1 mm.

Type locality: Abbott station 41–D–3, Ifaluk Atoll, Sept. 17, 1953.

Material: Abbott stations 41–D–3 (2), 42–F–2 (2), 46–E–2 (1), 58–F–2 (1), 66–E–10 (1), 102–B–2 (1), 122–C–1 (1).

Distribution: Ifaluk Atoll, Caroline Islands.

FIGURE 1.—*Azotostoma fusta*, new species, female, 2 mm., Abbott sta. 102-B-2: *a*, lateral view; *b*, antenna 2; *c*, *d*, gnathopods 1, 2; *e*, *f*, pereopods 4, 5.

Family Anamixidae

Genus *Anamixis* Stebbing

***Anamixis falarikia*, new species**

FIGURE 3

Diagnosis: Head partially fused with first pereonal segment, but a slightly movable articulation is present; head produced forward, with a sharp tooth for a lateral lobe; antenna 1 attached to apex of head, antenna 2 attached well behind lateral corner of head;

antenna 1 with a small distal tooth on article 1; coxa 1 apparently completely fused with pereonal segment 1, for no visible lamina is present; lower part of mouth area bearing a toothed lamina but it does not project as an epistome as in *Paranamixis bocki* Schellenberg (1938a); behind the lamina are 2 bilateral bulbs and behind these is the fully developed maxilliped, lacking any but vestigial inner plates; fourth maxillipedal palp article remarkably elongated and curved;

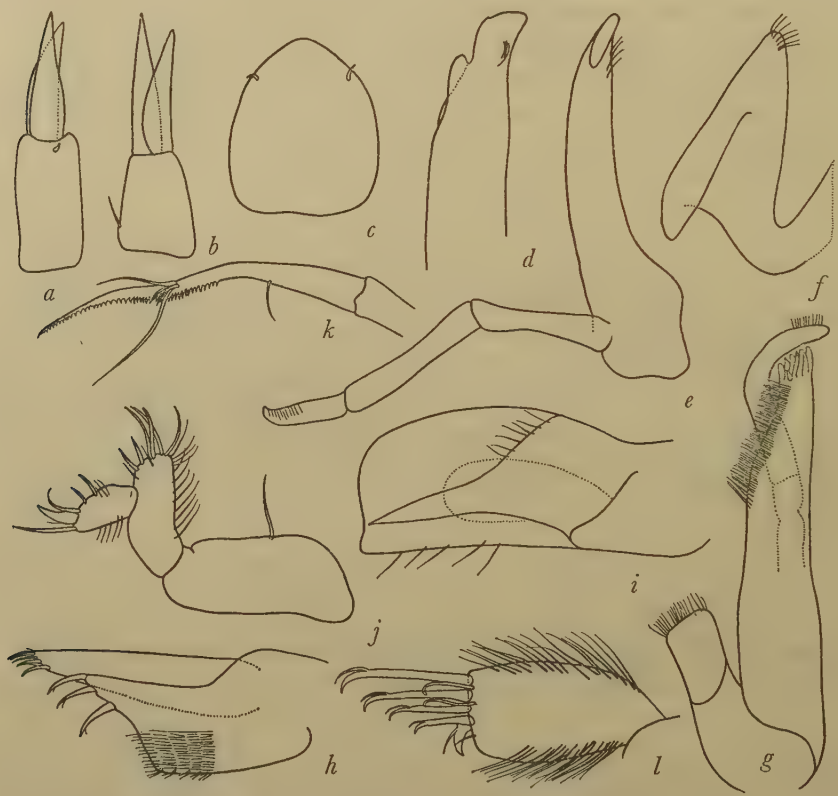

FIGURE 2.—*Azotostoma fusta*, new species, female, 2 mm., Abbott sta. 102-B-2: *a*, *b*, two views of uropod 3; *c*, telson; *d*, *e*, mandibles, two views; *f*, half of lower lip; *g*, *h*, maxillae 1, 2; *i*, maxilliped, dotted line is base of palp behind; *j*, palp of maxilliped; *k*, *l*, ends of gnathopods 1 and 2, enlarged.

opposing chelas of gnathopod 1 apically blunt and slightly bulbous, neither claw bearing an apical spine, seventh article (upper claw) with a toothed inner edge; coxa of gnathopod 2 broader than long, much larger than coxa 3, lower edge sinuous, article 2 with a distal tooth and bump, process of article 5 short in comparison with other species of the genus, article 6 broadly expanded, palm longer than hindmargin and cut into 6 teeth, article 7 apically bifid; second

articles of pereopods 3–5 only moderately expanded and lacking radial lines seen in other species of the genus; outer rami of uropods 1 and 2 quite short, about half the length of inner rami, uropod 3 missing; telson apically rounded.

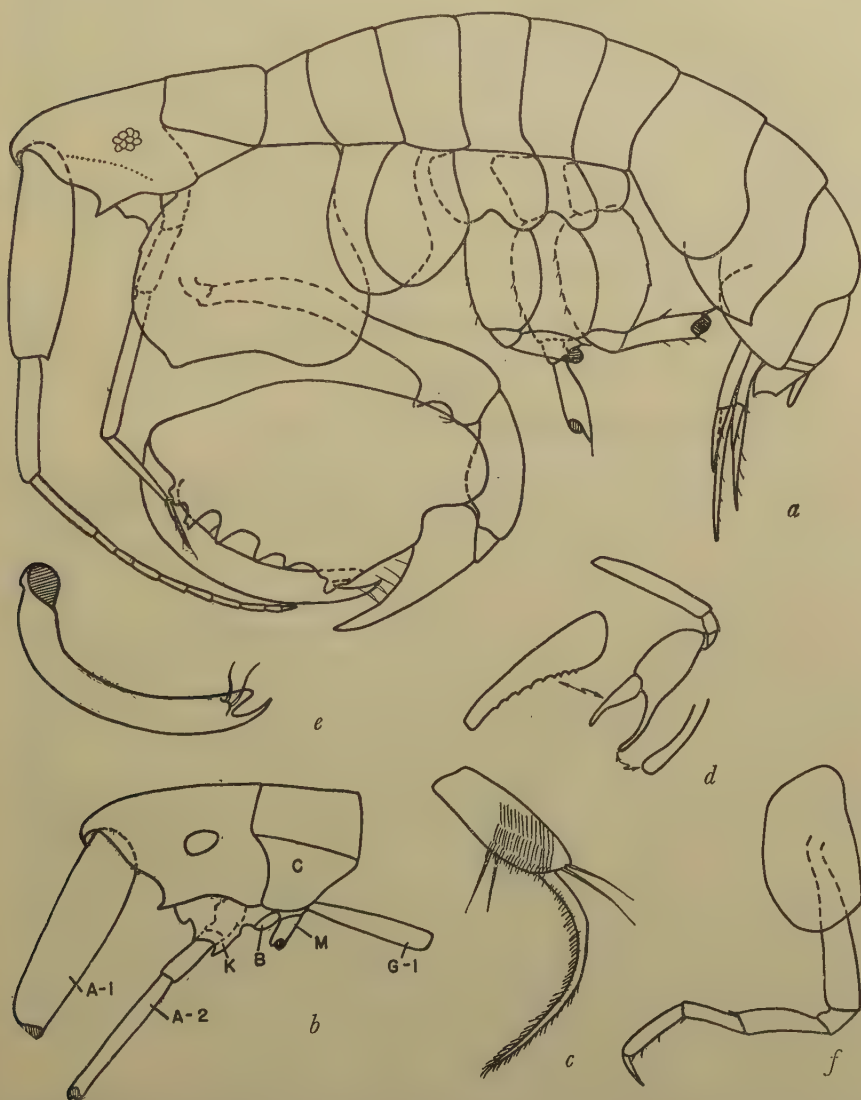

FIGURE 3.—*Anamixis falarikia*, new species, male, holotype, 2.2 mm., Abbott sta. 145-C-2: *a*, lateral view; *b*, view of head (A-1, A-2 = antennae; K = ventral keel; B = bi-lateral bulbs; M = base of maxilliped; C = lateral surface of peraeon segment 1 representing coxa 1; G-1 = base of gnathopod 1); *c*, last two articles of maxillipedal palp; *d*, gnathopod 1; *e*, finger of gnathopod 2; *f*, pereopod 1.

Holotype: USNM 105706, ?male, 2.2 mm, figured.

Type locality: Abbott station 145–C–2, Ifaluk Atoll, Oct. 21, 1953.

Material: The holotype and one specimen from Bayer station 465 C 1/4.

Relationship: This anamixed is unusual in the shape and ornamentation of its head, the long fourth palp article of the maxilliped, the broadly expanded palm of gnathopod 2 cut into large teeth and the apically bifid claw of gnathopod 2. As such, it bears no close relationship to the other species of the genus.

Instead of small dentitions on the dactyl of gnathopod 1, the other specimen from station 465 C 1/4 has small, short setae. This may be a growth stage or perhaps indicate a different sex.

Distribution: Ifaluk Atoll, Caroline Islands.

Anamixis stebbingi Walker

FIGURE 4

Anamixis stebbingi Walker, 1904, pp. 259–261, pl. 3, fig. 18.

Diagnosis: Head partially fused with first pereonal segment, but a slight, movable articulation is present; head not strongly produced forward as in *A. falarikia*, new species, bearing a sharp tooth for a lateral lobe, rostrum distinct from rest of head; antenna 1 attached behind apex of rostrum, distal end of article 1 not bearing a small tooth; lower part of mouth area bearing a lamina with a single acute tooth, not projecting as an epistome would; fourth maxillipedal palp article remarkably elongated and curved as in *A. falarikia;* opposing chelae of gnathopod 1 apically blunt and slightly bulbous, neither chela bearing an apical spine, seventh article (claw) with a toothed inner edge; coxa of gnathopod 2 longer than broad, not larger than coxa of pereopod 1, lower edge slightly sinuous, article 2 lacking a distal tooth or bump, process of article 5 long, article 6 narrow, palm not distinct, hind edge straight, bearing a distal tooth and a small subdistal serration, article 7 simple, not bifid, bearing a single inner protuberance; second articles of pereopods 3–5 slightly more expanded than in *A. falarikia*, with faint radial lines; outer rami of uropods 1–2 quite short, about half the length of the inner rami, uropod 3 missing; telson apically rounded.

Material: Abbott stations 145–C–2 (1), 177–G–5 (1).

Remarks: This was the second species of the genus described and differs from the type species, *A. hanseni*, by the lack of apical spines on the chelae of gnathopod 1 and the single, not double protuberance on the claw of gnathopod 2. The first coxa is seen as a distinct lateral plate produced forward into a bifid apex.

The specimen from station 177–G–5 bears small setae, not teeth on the inner edge of the claw on gnathopod 1. This may indicate a difference in sex as suggested also in the case of *A. falarikia*, new species, where the two known specimens differ in the same way.

Distribution: Ceylon; Ifaluk Atoll, Caroline Islands.

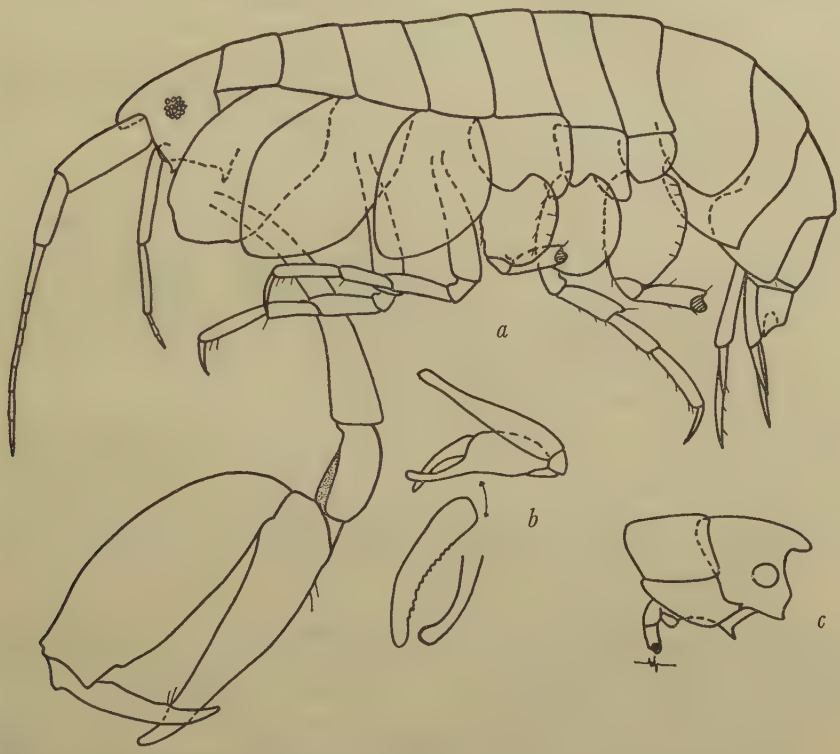

FIGURE 4.—*Anamixis stebbingi* Walker, ?male, 2 mm., Abbott sta. 145-C-2: *a*, lateral view; *b*, gnathopod 1 with ends of chelae enlarged; *c*, head showing projection of ventral keel.

Family Leucothoidae

Genus *Leucothoe* Leach

Leucothoe hyhelia, new species

FIGURE 5

Diagnosis: Article 3 of antenna 1 less than a third as long as article 1; lateral lobes of head rounded, not acute; telson pointed apically; article 2 of pereopod 5 subquadrate, rather expanded; second pleonal epimeron with small tooth at lower posterior corner, third epimeron quadrate, not produced, with softly rounded corner;

palms of gnathopods in both sexes nearly smooth, female smoother than male, sparsely serrate, the serrations larger near finger hinge; gnathopod 1 moderately slender, article 6 evenly expanded throughout, article 7 less than one fourth as long as article 6; eyes round. Mouthparts like *L. spinicarpa* figured by Sars (1895, pl. 100).

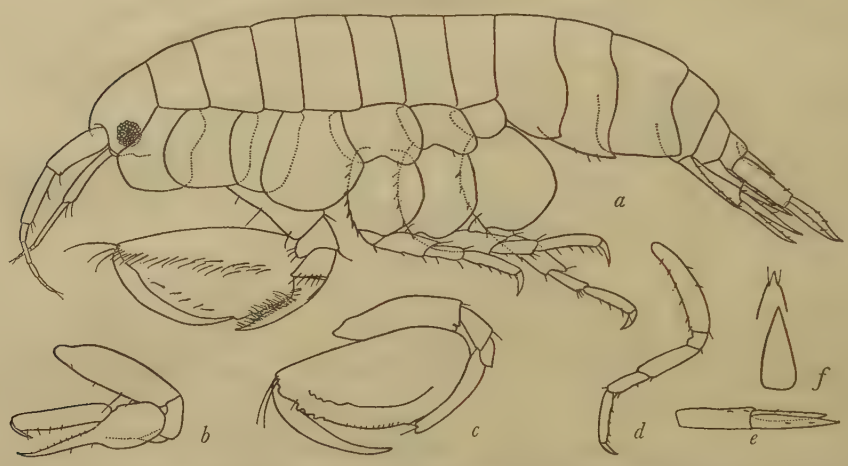

FIGURE 5.—*Leucothoe hyhelia*, new species, holotype, male, 3.4 mm., Reish sta. E-158: *a*, lateral view; *b*, *c*, gnathopods 1, 2, with inset of palmar edge of a female second gnathopod in fig. *c*; *d*, pereopod 2; *e*, uropod 3; *f*, telson.

Holotype: USNM 107574, male, 3.4 mm.

Type locality: Reish station E–158, Parry Island, Eniwetok Atoll, June 30, 1957.

Material: Reish stations E–147 (4), E–158 (5).

Relationship: This species differs from *Leucothoe tridens* Stebbing (1888, pl. 47) by the broader second article of pereopod 5, the small point at the apex of the telson, the much shorter third article of the first antenna. It differs from *Leucothoe spinicarpa* (in Sars 1895, pls. 100, 101, fig. 1) by the broader and more quadrate second article of pereopod 5, the unevenly and sparsely denticulate palm of the second gnathopods in both sexes, and the shorter finger of gnathopod 1. The new species and the two mentioned above are perhaps the most closely related trio in the genus but the differences seem to be uniform.

Distribution: Eniwetok Atoll.

Leucothoe micronesiae, new species

FIGURE 6

Diagnosis: Article 3 of antenna 1 about 40% as long as article 2; article 6 of gnathopod 1 widest at its base, tapering to a blunt point,

not serrate on inner edge, article 7 very short; article 6 of second gnathopod 1.6 times as long as broad, palm oblique, bearing a blunt tooth at finger hinge, proximal to which is another tooth, separated by a small sinus, then a prominent tooth near defining corner of palm, separated from the more distal tooth by a wide, flat sinus, defining corner indistinctly bifurcate; gnathopods variable in palmar armature with another configuration on left side of holotype having the process at finger hinge and the next proximal much closer together and an additional medial tooth, with tooth near defining corner smaller and bifurcation at corner obsolescent; telson short, apically tridentate.

FIGURE 6.—*Leucothoe micronesiae*, new species, holotype, female, 2.5 mm., Abbott sta. 155-157-G-1: *a*, lateral view; *b*, gnathopod 1; *c*, *d*, medial and lateral views of gnathopod 2; *e*, telson; specimens of unknown sex, 1.0, 1.3 mm., Abbott sta. 179-184-M-1: *f*, *g*, second gnathopods.

Holotype: USNM 106805, ovigerous female, 2.5 mm.

Type locality: Abbott station 155–157–G–1, Ifaluk Atoll, Oct. 23, 1953.

Material: Abbott stations 122–C–1 (2), 155–157–G–1 (3), 177–G–5 (1), 179–184–M–1 (2); Bayer station 467 (8).

Relationship: This species may represent the female and young of *Leucothoe minuscula* Schellenberg (1938a), although it would have to be considerably better developed than the female figured by Schellenberg; the male of that species has article 6 of the second gnathopod 2.3 times as long as wide, thus considerably longer than in the present females; only for such a reason have I decided to erect this new species.

This species is related also to *L. brevidigitata* Miers (see *L. flindersi* Stebbing, 1888) because of the short dactyl of gnathopod 1 but differs by the sixth article being broad at its base whereas in *L. brevidigitata* it is narrow at the base.

768–792—65——3

Chilton (1923) fused *L. brevidigitata* with *L. spinicarpa* but I believe it should be resurrected on the basis of the small dactyl of gnathopod 1.

This new species bears resemblance to *L. hornelli* Walker (1904) (=*L. furina* Savigny by Schellenberg, 1928) in the structure of the gnathopodal palm but differs by the short dactylus of gnathopod 1. It also resembles *L. stegoceras* Walker (1904) but according to his comparison with *L. spinicarpa* that species also has a long dactylus of gnathopod 1 and thus would be specifically distinct from the new species.

Distribution: Ifaluk Atoll, Caroline Islands.

Leucothoe tridens Stebbing

Leucothoe tridens Stebbing, 1888, p. 777, pl. 47; 1906, p. 166.
?*Leucothoe tridens*.—Chilton, 1906, p. 268.—Schellenberg, 1938a, pp. 21–23, fig. 11.
?*Leucothoe tridens recifensis* Schellenberg 1938b, pp. 205–206.

Material: Abbott stations 50–E–1 (1), 160–165–J–5 (1).

Remarks: These specimens together fit Stebbing's figures very closely, but those parts missing on one specimen had to be confirmed on the other specimen. Unlike Schellenberg's (1938a) figure the lateral head lobes are rounded, not acute. Stebbing's figure is not wholly clear on this point.

Distribution: New Zealand, 2000 m. (questionable type locality); ?Auckland, New Zealand, 25 fms.; ?Gilbert Islands; ?Philippines; ?Brazil; ?Ifaluk Atoll, Caroline Islands.

Genus *Leucothoella* Schellenberg

Leucothoella bannwarthi Schellenberg

FIGURE 7

Leucothoella bannwarthi Schellenberg, 1928, pp. 638–640, fig. 199.—K. H. Barnard, 1937, p. 153.—Schellenberg, 1938a, p. 26.

Material: Abbott stations 99–F–3 (2), 113–H–2 (2), 116–F–3 (1).

Remarks: Although the first coxa is not as strongly serrate as noted by Schellenberg (1928), the writer finds no other major differences from that original description and assigns these specimens thereto.

Distribution: Suez; Red Sea; Philippines; Ifaluk Atoll, ?Caroline Islands; Marshall and Fiji Islands.

Genus *Leucothoides* Shoemaker

Leucothoides pottsi Shoemaker

Leucothoides pottsi Shoemaker, 1933, pp. 249–250, fig. 3.—Schellenberg, 1938a, pp. 26–28, fig. 13.—Ruffo, 1959, p. 2, pl. 1, figs. 1, 2.

Material: Abbott stations 41–D–3 (1), 158–159–D–5 (1), 160–165–J–5 (1), 177–G–5 (2); Bayer stations 465 C 1/4 (1), 467 (1); 594 (3).

Distribution: Dry Tortugas, Caribbean Sea; Gilbert and Marshall Islands; Ifaluk Atoll, Caroline Islands.

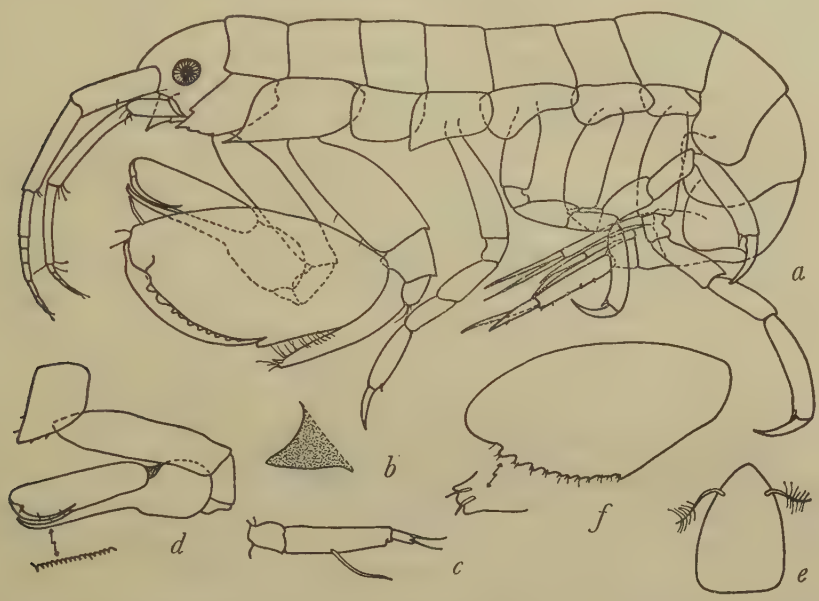

FIGURE 7.—*Leucothoella bannwarthi* Schellenberg, male, 2.5 mm., Abbott sta. 113-H-2: *a*, lateral view; *b*, epistome; *c*, mandibular palp; *d*, gnathopod 1; *e*, telson; *f*, gnathopod 2.

Family Colomastigidae

Genus *Colomastix* Grube

Colomastix pusilla Grube

Colomastix pusilla Grube.—J. L. Barnard 1955, pp. 39–42, fig. 20 (with references).

Material: Abbott stations 113–H–2 (2), 116–F–3 (1), 122–C–1 (1), 209–F–4 (1); Bayer stations 467 (9), 594 (4), 670 (1), 709 (3), 756 (5).

Distribution: Pantropical and warm temperate.

Family Pontogeneiidae

Ronco, new genus

Diagnosis: Mandibular palp slender; upper lip bilobed, epistome unproduced; inner plate of maxilla 1 poorly setose, slender, inner plate of maxilla 2 slender, not setose on inner edge, outer plate twice as wide as inner plate; accessory flagellum vestigial but composed of one long article; lower lip with well-developed inner lobes; gnathopods not linear, sixth articles expanded, fifth articles with hindlobes; antenna 1 longer than 2; telson split more than half its length.

Type species: *Ronco sosa,* new species.

Relationship: This genus is closely related to *Pseudomoera* Schellenberg (1929), of which the unique type species is *P. gabrieli* (Sayce 1901) described from Australian freshwaters at an altitude of 1500 feet. *Ronco* differs from *Pseudomoera* in its bilobed upper lip, its slender mandibular palp, and the unequal lobes of maxilla 2.

It differs from *Paramoera* Miers by the poorly setose inner plate of maxilla 1 and the well-developed inner lobes of the lower lip and from *Djerboa* Chevreux by the lack of an accessory claw on pereopods 1–5 and the nonlinear gnathopods.

It is especially related to *Eusiroides* Stebbing, differing only by the strongly bilobed upper lip. Species of *Eusiroides* bear very stout spines on the gnathopodal palms.

Ronco sosa, new species

FIGURE 8

Diagnosis: With the characters of the genus.

Descriptive notes: The eyes are quite large and black, with the side lobes of the head broadly rounded in front, not notched; rostrum small; upper lip notched; pereopods 1 and 2 with a large distal spine on article 6; third pleonal epimeron quadrate behind.

Holotype: USNM 106871, male, 2.2 mm.

Type locality: Abbott station 31–D–2, Ifaluk Atoll, Sept. 4, 1953.

Material: Abbott stations 31–D–2 (1), 160–165–J–5 (1); Bayer station 638 (1).

Distribution: Ifaluk Atoll, Caroline Islands.

Family Synopiidae (incl. Tironidae)

Synopia variabilis Spandl

FIGURE 9

Synopia variabilis Spandl, 1923 [not seen].—Spandl, 1924, pp. 48–50, fig. 17a–g.

Material: Abbott station 194–E–2 (2); Reish stations E–52 (12), E–182 (1).

Distribution: Red Sea; Ifaluk and Eniwetok Atolls.

Family Gammaridae

Paraceradocus micramphopus Stebbing (1910a) should be transferred to the genus *Metaceradocus* Chevreux (1925), of which it forms the third species.

Genus *Elasmopus* Costa

A key to this genus is presented on pages 497–498. The following species are omitted:

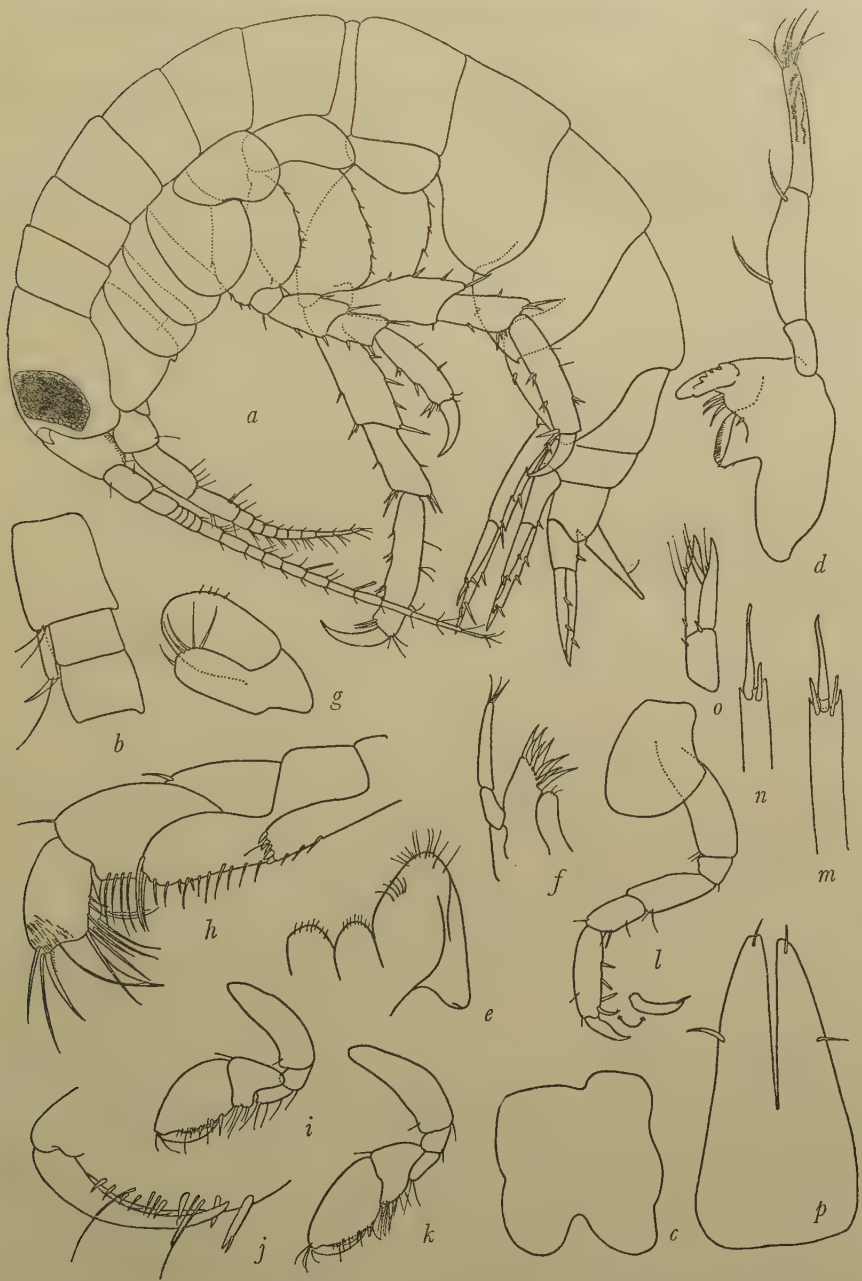

FIGURE 8.—*Ronco sosa*, new species, holotype, male, 2.2 mm., Abbott sta. 31-D-2: *a*, lateral view; *b*, part of antenna 1 showing accessory flagellum; *c*, upper lip; *d*, mandible; *e*, lower lip with one outer lobe missing; *f*, *g*, maxillae 1, 2; *h*, maxilliped; *i*, *j*, gnathopod 1; *k*, gnathopod 2; *l*, pereopod 2; *m*, *n*, ends of rami of uropod 2; *o*, uropod 3; *p*, telson.

Elasmopus atolgidus, new species: 1 female (see diagnosis for special features).

Elasmopus besnardi Oliveira (1951): a female (perhaps a synonym of *E. brasiliensis* (Dana)).

Elasmopus brasiliensis (Dana): Oliveira's (1951) reference and figures of this species are those of *E. pectenicrus* (see discussion in text).

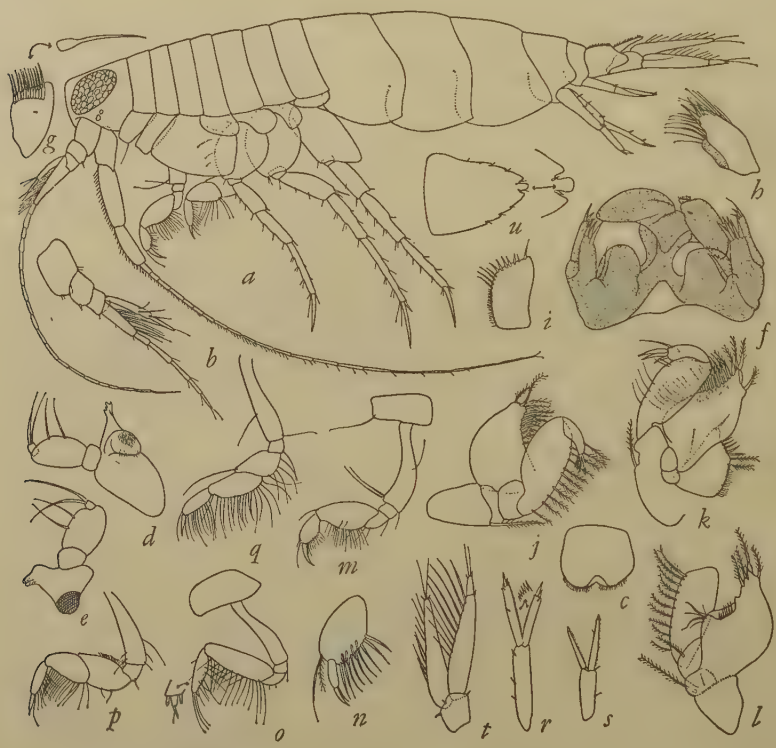

FIGURE 9.—*Synopia variabilis* Spandl, male, 3.8 mm., Abbott sta. 194-E-2: *a*, lateral view; *c*, upper lip; *d*, *e*, mandibles; *f*, complex of first maxillae and lower lip; *g*, *h*, plates of maxilla 1; *i*, inner plate of maxilliped; *j*, *l*, maxilliped, lateral views; *m*, *o*, gnathopods 1, 2; *p*, *q*, pereopods 1, 2; *r*–*t*, uropods 1, 2, 3: *u*, telson; female, 2.7 mm.: *b*, antenna 1; *k*, maxilliped; *n*, end of gnathopod 1.

Elasmopus caprai Maccagno (1936): no figures (drawings of male gnathopod 2 needed).

In addition, the following notes must be considered:

Elasmopus delaplatus Stebbing (1888) is cited twice in couplets 17 and 28 because of uncertainty about the defining palmar process on male gnathopod 2.

Elasmopus levis Smith is the species considered in couplet 8 and not the homonym *E. levis* K. H. Barnard (1916) which has been renamed *E. vagans* by K. H. Barnard (1940).

Elasmopus chevreuxi Cecchini (1928): both Schellenberg (1938a) and Ruffo (1959) refer this to *E. brasiliensis*.

References to all species may be consulted in J. L. Barnard's index (1958) except:

E. rapax mutatus and *E. holgurus:* both described by J. L. Barnard (1962b).

The following species should be transferred to *Maera* Leach: *Elasmopus latibrachium* Walker (1905), *E. smirnovi* Bulycheva (1952), and *E. sokotrae* Walker and Scott (1903).

Key to Males of *Elasmopus*

1. Some body segments dorsally dentate 2
   No body segments dorsally dentate 5
2. Four segments dorsally dentate 3
   One segment dorsally dentate 4
3. Gnathopod 2, palm very oblique . . . . . **E. diemenensis**
   Gnathopod 2, palm nearly transverse . . . . . **E. suensis**
4. Article 2 of pereopod 5 alate, proximally widened . . . . . **E. neglectus**
   Article 2 of pereopod 5 normally oval . . . . . **E. japonicus**
5. Gnathopod 2, palm transverse . . . . . **E. dubius**
   Gnathopod 2, palm oblique 6
6. Right and left second gnathopods differing in structure . . . . **E. bollonsi**
   Right and left second gnathopods alike in structure. 7
7. Palm of gnathopod 2 with a large cuplike medial hollow 8
   Palm of gnathopod 2 lacking medial cuplike hollow 9
8. Medial apex of each telsonic lobe rounded . . . . . **E. pocillimanus**
   Medial apex of each telsonic lobe sharp . . . . . **E. levis**
9. Palm of gnathopod 2 lacking major teeth, tubercles or processes 10
   Palm of gnathopod 2 bearing teeth, tubercles or with a blunt process near finger hinge 15
10. Palm of gnathopod 2 distinct and defined either by a stout articulated spine or by a sharp palmar corner 11
    Palm of gnathopod 2 not distinctly defined 12
11. Gnathopod 2, palm defined by a stout spine, no other stout spines present . . . . . **E. magnispinatus**
    Gnathopod 2, palm defined by a sharp corner, palm and hindmargin of article 6 furnished with additional spines . . . . . **E. steinitzi**
12. Dactylus of pereopods 1–2 with 2 nails, article 6 with a stout distal spine . . . . . **E. diplonyx**
    Dactylus of pereopods 1–2 with one or no nail, article 6 lacking a stout distal spine 13
13. Gnathopod 2, part of palm minutely crenulated . . . . . **E. dentiferus**
    Gnathopod 2, palm not minutely crenulated 14
14. Articles 6–7 of gnathopod 2 quite elongated, article 7 sinuous . . **E. gracilis**
    Articles 6–7 of gnathopod 2 not elongated, article 7 not sinuous. **E. brasiliensis**

15. Palm of gnathopod 2 bearing defining tooth 16
Palm of gnathopod 2 lacking defining tooth 21
16. Gnathopod 2 with teeth besides defining one 17
Gnathopod 2 only with defining tooth. . . . . **E. minimus**
17. Palm of male gnathopod 2 bearing 2 teeth . . . . . **E. delaplata** (in part)
Palm of male gnathopod 2 bearing 3 or more teeth 18
18. Palmar hinge tooth of male gnathopod 2 armed with spines 19
Palmar hinge tooth of male gnathopod 2 not armed with spines. **E. calliactis**
19. Middle palmar tooth of male gnathopod 2 broadly and asymmetrically subconical . . . . . **E. holgurus**
Middle palmar tooth of male gnathopod 2 narrowly conical or columnar . . 20
20. Article 2 of pereopods 3–5 bearing long setae behind, accessory flagellum 2 or more articulate . . . . . **E. rapax**
Article 2 of pereopods 3–5 lacking long setae behind, accessory flagellum uni-articulate . . . . . **E. rapax mutatus**
21. Dactyli of pereopods bearing lines of small erect, blunt teeth. **E. spinidactylus**
Dactyli of pereopods smooth or bearing articulated setae 22
22. Apices of telson broadly rounded, not spinose . . . . . **E. affinis**
Apices of telson subacute, truncate, notched, convex and/or spinose . . . 23
23. Article 2 of pereopod 4 with a fluted and crenulated posterodistal excavation. **E. pectenicrus**
Article 2 of pereopod 4 oval, serrate normally 24
24. Palm of gnathopod 2 heavily setose. 25
Palm of gnathopod 2 not heavily setose 29
25. Third pleonal epimeron quadrate behind 26
Third pleonal epimeron with a small posterodistal tooth 27
26. Pereopod 5, anterior edge of article 4 produced downward . **E. ecuadorensis**
Pereopod 5, anterior edge of article 4 not produced . . . . . **E. perditus**
27. Pereopod 5, anterior edge of article 4 produced downward strongly. **E. delaplata** (in part)
Pereopod 5, anterior edge of article 4 not produced downward 28
28. Gnathopod 2, process near finger hinge bearing stout spines . . **E. buchneri**
Gnathopod 2, process near finger hinge lacking stout spines . **E. antennatus**
29. Palm of gnathopod 2 with 3 processes. . . . . **E. erythraeus**
Palm of gnathopod 2 with 2 processes. . . . . **E. pseudaffinis**
Palm of gnathopod 2 with one process 30
30. Palm of gnathopod 2 lined with stout spines its full length . . **E. spinimanus**
Palm of gnathopod 2 lacking spines or with spines restricted to a group . . 31
31. Gnathopod 2, middle of palm with rod-like process . . . . . **E. excavatus**
Gnathopod 2, palm bearing only a short, broad process near hinge. **E. fusimanus**

Elasmopus atolgidus, new species

FIGURE 10

Diagnosis of female: Eyes large, black; accessory flagellum composed of two articles tipped with a minute third; pereopods 1–2 bearing 2 large curved distal spines on sixth articles, article 7 with distal claw scarcely distinct, but bearing 3 minute setules; posterior edge of third pleonal epimeron slightly convex, lower corner rounded, except for

a minute notch; no segments with dorsal teeth; telson with rounded apices, no lateral notches, each lobe with a spine about halfway to base; gnathopod 1 unusually stout; gnathopod 2 with oblique palm and microscopic translucent ridge along distal half.

Holotype: USNM 106877, ovigerous female, 3.5 mm. Unique.

Type locality: Abbott station 23–E–2, Ifaluk Atoll, Sept. 4, 1953.

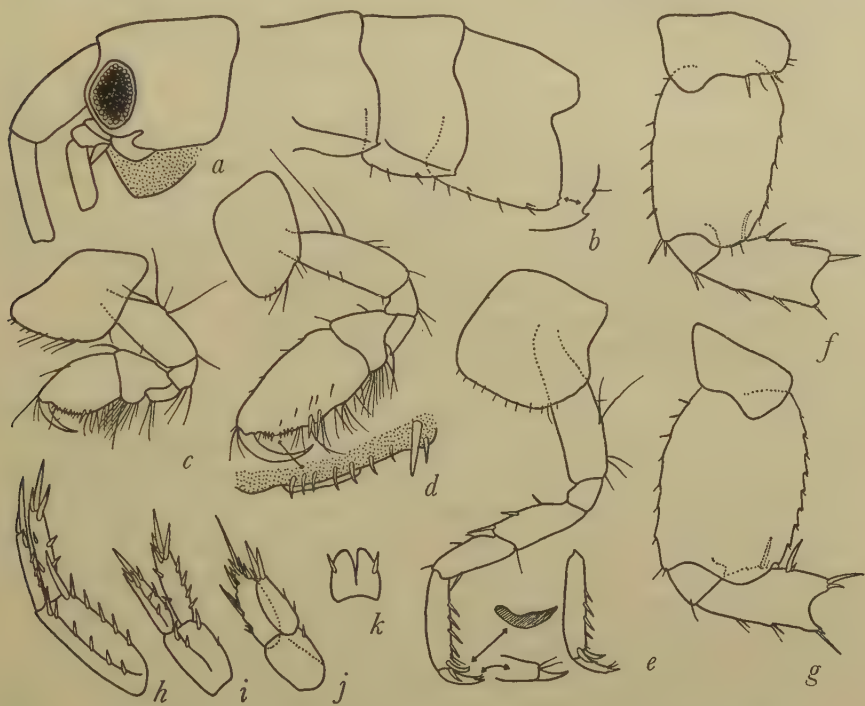

FIGURE 10.—*Elasmopus atolgidus*, new species, holotype, female, 3.5 mm., Abbott sta. 23-E-2: *a*, head; *b*, pleon segments 1–3; *c*, *d*, gnathopods 1, 2; *e–g*, pereopods 2, 4, 5; *h–j*, uropods 1, 2, 3; *k*, telson.

Relationship: This single specimen is so unique to the atoll collections that it is worthy of description, despite its slightly damaged condition and the fact that it is a female. The species needs distinction from only two others described, because of the combination of large eyes, spines on pereopods 1–2, and the unusual configuration of the telson (usually with lateral notches or truncate, spinose apices in *Elasmopus*). The new species is related to *E. diplonyx* Schellenberg (1938a) by the stout spines of pereopods 1–2; Schellenberg described *E. diplonyx* with one distal spine; the second spine in the new species is easily overlooked because it does not project but overlies the dactylus; however, the apically incised telson and stout dactylar spine of *E. diplonyx* are distinctive.

Elasmopus atolgidus is also related to *E. perditus* Reid (1951, western Africa), described as a unique male. Specifically the new species differs only by the fact that Reid stated that the telsonic spines were apical whereas in the present species they are considerably subapical. Until males of the new species and females of *E. perditus* can be compared no other distinctions can be stated.

Distribution: Ifaluk Atoll, Caroline Islands.

Elasmopus brasiliensis (Dana)

FIGURE 11

Elasmopus brasiliensis (Dana).—Stebbing, 1906, p. 443 (in part, not *E. pectenicrus*).—Chevreux, 1911, pp. 222–225, fig. 12, pl. 15 (figs. 14–20).

Other references with unverified identification:

Elasmopus brasiliensis (Dana).—Stebbing, 1917a; Poisson and Legueux, 1926; Chevreux, 1927; Alderman, 1936; Ruffo, 1938; Shoemaker, 1942; Ruffo, 1947.

not *Elasmopus brasiliensis* (Dana).—Oliveira, 1951, pp. 4–10, pls. 1–4, figs. 1–30 (=*E. pectenicrus* [Bate]).

Material: Abbott stations 87–H–2 (7), 89–F–3 (11), 95–L–4 (2), 95–O–4 (3).

Remarks: No satisfactory topotypic reidentification of *Elasmopus brasiliensis* (Dana) has been made since its original description. The type locality is Rio de Janeiro. Bate (1862) simply copied Dana's original description and a figure, then proceeded to describe on a later page *Moera* [sic] *pectenicrus* with type locality of New Guinea.

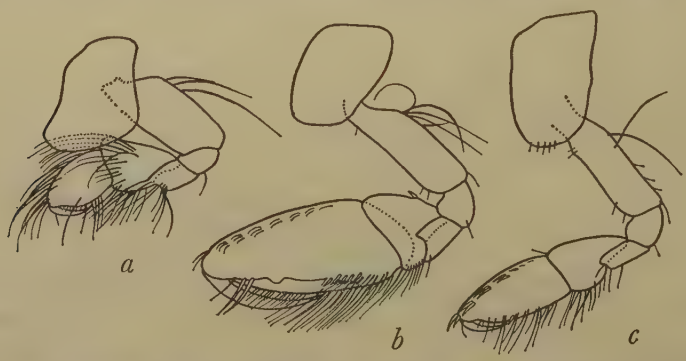

FIGURE 11.—*Elasmopus brasiliensis* (Dana), male, 3 mm., Abbott sta. 89-F-3: *a*, *b*, gnathopods 1, 2; female, 3 mm.: *c*, gnathopod 2.

In 1906 Stebbing fused the two species, although Dana's and Bate's figures of the two are different; however, Dana's figure and description were quite plain and could have contained errors. In 1911 Chevreux described and figured specimens from Algeria fitting Dana's species because of the same plainness; however, Algeria is far removed from the type locality of *E. brasiliensis*. In 1916 K. H. Barnard resurrected *E. pectenicrus*, pointing out Chevreux's (1911)

paper and stating that *E. pectenicrus* should be separated from *E. brasiliensis*. Since that time only a few largely Mediterranean identifications of *E. brasiliensis* have been published while many have been recorded for *E. pectenicrus*. In 1951 Oliveira redescribed *E. brasiliensis* from Brazilian material, along with two other species described as new. Although she mentioned *E. pectenicrus* in a key concerning antennae, she must have overlooked the fact that the material of *E. brasiliensis* she redescribed was precisely *E. pectenicrus*. Her failure to discuss this question was unfortunate. If Chevreux's (1911) description did not exist, then one might automatically re-synonymize *E. pectenicrus* with *E. brasiliensis*, on the basis that Oliveira discovered it in the type locality; but one cannot consider that the search has been exhausted, since an animal from Algeria fits the description better. In addition, Oliveira's *Elasmopus besnardi*, apparently based on a female from Trinidad, could also be *E. brasiliensis*, despite an obviously poor figure of the animal. Perhaps it is a female corresponding to Chevreux's redescription. Thus, the question is not solved, especially in the lack of ecological information as to abundances and sizes (probing the probability Dana might have caught the largest or most abundant species), and the fact that Oliveira included Chevreux's (1911) reference to *E. brasiliensis*, while failing to note the very great differences between the two collections.

The material at hand corresponds well with that figured by Chevreux (1911), except that adults are only 3 mm. in length, half the size of those from Algeria; the hindmargin of the third pleonal epimeron is straighter and the lower tooth slightly smaller than figured by Chevreux. Close observation of the male second gnathopod shows a pair of large spines at the distal end of the inner face of the palm, not shown by Chevreux, plus a medial ridge of chitin having a small bump about halfway along the palm. These gnathopodal characteristics should be rechecked on Algerian material and on topotype materials, when available.

Distribution: This is the first record of the species from the Pacific Ocean. Known previously from Brazil, Mediterranean, South Africa.

Elasmopus excavatus Schellenberg

Elasmopus excavatus Schellenberg, 1938a, pp. 58–59, fig. 30.

Material: Abbott station 90–C–4 (1).

Distribution: Gilbert Islands; Ifaluk Atoll, Caroline Islands.

Elasmopus pseudaffinis Schellenberg

FIGURES 12, 13

Elasmopus pseudaffinis Schellenberg, 1938a, pp. 53–54, fig. 25.

Material: Abbott stations 28–D–3 (2), 30–C–4 (2), 39–E–5 (3), 57–E–2 (1), 58–F–2 (3), 60–D–1 (1), 66–E–10 (3), 70–C–3 (1), 72–G–3 (2),

FIGURE 12.—*Elasmopus pseudaffinis* Schellenberg, male, 9 mm., Reish sta. E-93: *a*, lateral view; *b*, *c*, gnathopod 1; *d*, pereopod 1; *e–g*, uropods 1, 2, 3; *h*, third pleonal epimeron of notched form with enlargement to the right; *i*, lower hindcorner of coxae 1–3; *j*, telson; male, 2.0 mm., sta. 85-F-3: *k*, gnathopod 2.

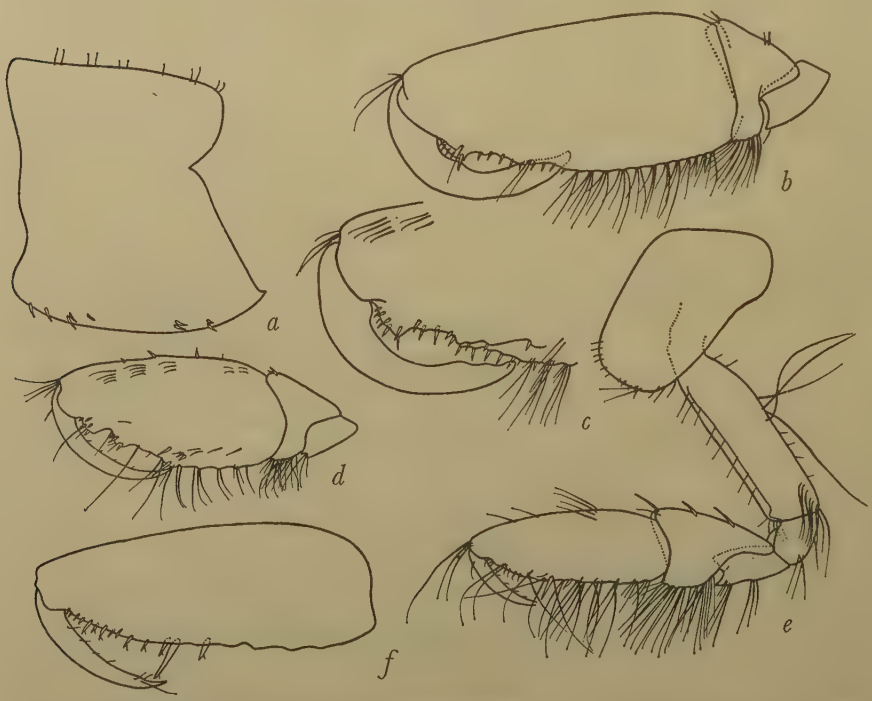

FIGURE 13.—*Elasmopus pseudaffinis* Schellenberg, male, 9 mm., Reish sta. E-93: *a*, third pleonal epimeron; *b*, *c*, gnathopod 2, lateral and medial views; male, 5 mm.: *d*, gnathopod 2, medial view; female, 6 mm.: *e*, *f*, gnathopod 2.

76–H–3 (1), 83–E–1 (3), 84–D–1 (2), 85–F–3 (2), 95–D–4 (2), 95–L–4 (1), 125–D–3 (1), 128–C–5 (2), 130–C–2 (4), 132–E–4 (1), 139–C–2 (7), 141–D–3 (1), 142–E–4 (6), 146–151–H–4 (2), 155–157–G–1 (5), 158–159–D–5 (1); Hand station CH–682 (1); Bayer station 756 (1); Reish stations E–2 (1), E–18 (8), E–24 (3), E–26 (2), E–27 (1), E–38 (1), E–40 (1), E–43 (1), E–44 (2), ME–56 (1), ME–57 (2), E–68 (1), E–75 (6), E–78 (5), E–86 (1), E–93 (15), E–96 (1), BE–100 (3), BE–102 (5), BE–103 (6), BE–104 (4), BE–107 (4), BE–109 (1), BE–111 (38), E–119 (3), E–127 (4), E–129 (5), E–136 (3), E–137 (8), E–140 (1), E–142 (1), E–184 (5).

Remarks: This species is most variable and it has been difficult to resolve the impression that not all of the material so listed belongs to this species. The third pleonal epimeron in well-developed males takes the shape of figure 12 A, with a straight hindedge and small, nearly upturned tooth at the lower corner. Younger males, still with the correct gnathopodal configuration may have the lower corner rounded-quadrate, with or without a notch at the lower corner as figured by Schellenberg (1938a). Females and juveniles generally have a rounded or notched lower corner. Females are indistinguishable from *Elasmopus minimus* Chevreux (1908) and Pirlot (1936) but all males, where associated with the females, have the gnathopods of *E. pseudaffinis*. No *E. minimus* males have been found in the collections.

The notches of the third pleonal epimeron often have a small sharp tooth enclosed.

Some of the females actually may be young *E. rapax*, but only one recognizable male of that species has been found in the collections from the USNM. Except in large specimens, the teeth on the hindedges of the second articles of pereopods 3–5 are small and relatively even.

Distribution: Gilbert Islands; Kapingamarangi Atoll; Ifaluk Atoll, Caroline Islands; Eniwetok Atoll, Majuro Atoll, Bikini Atoll, Marshall Islands.

Elasmopus rapax Costa

FIGURE 14

Elasmopus rapax Costa.—J. L. Barnard, 1955, pp. 10–12, fig. 5.

Material: Abbott station 42–F–2 (2).

Remarks: The male at hand is more typical of the classic figures of this species (Sars, 1895, pl. 183) than the material reported by J. L. Barnard (1955) from the Hawaiian Islands. The large outer palmar tooth seen on the Hawaiian specimens is absent.

Distribution: Cosmopolitan tropical-temperate.

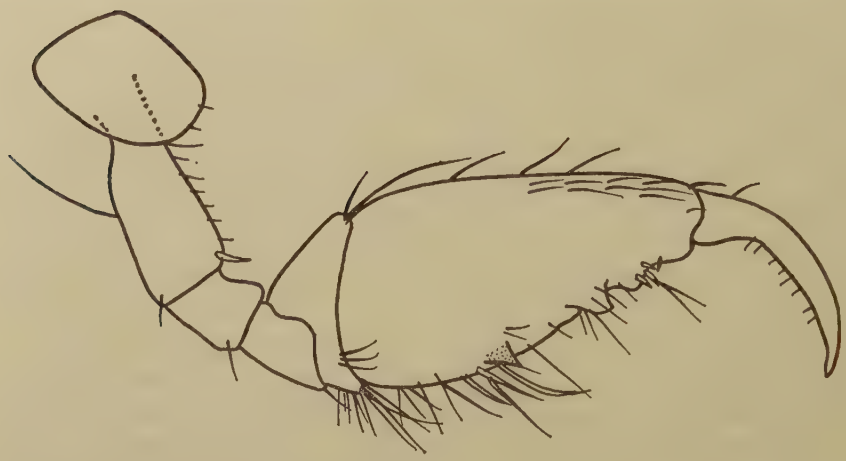

FIGURE 14.—*Elasmopus rapax* Costa, male, 3.2 mm., Abbott sta. 42-F-2: gnathopod 2, medial view.

Elasmopus spinidactylus Chevreux

Elasmopus spinidactylus Chevreux, 1907, pp. 413–414; 1908, pp. 486–489, fig. 9.—Walker, 1909, pp. 336–337.—Schellenberg, 1938a, p. 55.—Shoemaker, 1942, p. 13.—Ruffo, 1954, p. 119.

Material: Abbott stations 13–C–1 (8), 14–B–3 (14), 18–E–4 (1), 24–C–1 (9), 29–C–1 (3); Reish stations E–26 (5), E–73 (13), E–76 (1), E–77 (10), E–93 (8), E–94 (11), E–95 (6), E–96 (1), BE–101 (35), BE–108 (2), BE–112 (20) BE–113 (21), E–128 (6).

Distribution: Gambier and Tuamotu Archipelagos; Chagos Islands; Clipperton Island; Venezuela; Ifaluk Atoll, Caroline Islands; Bikini and Eniwetok Atolls, Marshall Islands.

Liagoceradocus, new genus

Diagnosis: Telson deeply cleft; accessory flagellum 2-articulate; pereonal and pleonal segments neither dorsally carinate nor toothed, nor spinose; rami of uropod 3 much longer than peduncle, not foliaceous, subequal in length, outer ramus biarticulate; inner edges of inner plates of both maxillae lined with setae; lower lip lacking inner lobes; palp article 3 of mandible longer than article 1, slightly subfalcate, lined on inner edge with 6 strong spine-setae; gnathopod 1 subchelate, palm nearly transverse, gnathopod 2 subchelate but palm indistinct from the hindmargin of article 6.

Type species: *Liagoceradocus pusillus*, new species.

Relationship: This genus differs from *Anelasmopus* Oliveira (1953) and *Pherusa* Leach (a homonym requiring a new name) by the long rami of uropod 3, of which the outer is biarticulate. It differs

from *Ceradocopsis* Schellenberg (1926) by the indistinct palm of gnathopod 2.

The genus resembles *Ceradocus* Costa closely but differs by the biarticulate outer ramus of uropod 3.

Liagoceradocus pusillus, new species

FIGURE 15

Diagnosis: With the characters of the genus.

Descriptive features: The mouthparts are generally like those of *Ceradocus*, although the third mandibular palp article is subfalcate and somewhat stouter than in most species of *Ceradocus;* the third maxillipedal palp article is produced apically as shown in the figure; eyes apparently are absent; lateral lobes of head broad and poorly

FIGURE 15.—*Liagoceradocus pusillus*, new species, holotype, ?male, 1.5 mm., Abbott sta. 123-D-2: *a*, lateral view, some details of pleon segments obscure; *b*, lower lip; *c*, articles 3–4 of maxillipedal palp; *d*, *e*, gnathopods 1, 2; *f*, pereopod 1; *g–i*, uropods 1, 2, 3; *j*, telson.

produced; third pleonal epimeron produced into a small tooth at the lower posterior corner.

Holotype: USNM 106884, ?male, 1.5 mm.

Type locality: Abbott station 123–D–2, Ifaluk Atoll, Oct. 18, 1953.

Material: 2 specimens from the type locality.

Distribution: Ifaluk Atoll, Caroline Islands.

Genus *Maera* Leach

This is perhaps the most abundant genus in the collections. Its taxonomy is in a confused state and seriously in need of a revision by a single specialist. The materials at hand are especially difficult to identify because of the lack of large suites of material from a single locality and because most of the specimens are immature. There is little difficulty in identifying *M. insignis* and *M. othonopsis* and the problem lies in those species having second gnathopods with transverse palms. Few of these specimens are mature and apparently the metamorphosis of the palmar configuration into the adult sculpturing passes through several stages in both males and females and all the initial stages are similar. Although the adult palms in *M. inaequipes*, *M. pacifica*, and *M. quadrimana* differ, they are alike in the juvenile stages.

In order to identify these species, one must examine the telson. Each lobe of the telson in *M. inaequipes* is deeply notched (Schellenberg 1938a, fig. 18) but to observe this character it is necessary to dissect and mount the telson of each individual, a laborious procedure in such small animals. *Maera pacifica* and *M. quadrimana* have blunt telsonic lobes (Schellenberg 1938a, figs. 19, 22) and often can be separated from each other by the stoutness of the second articles on pereopods 3–5 of *M. pacifica* (see Schellenberg 1938a, figs. 19–22). Unfortunately, many of the specimens at hand have lost the pereopods so that positive identification is impossible. When one specimen in a lot can be identified as one or the other species, I have included the remaining damaged specimens in the identification.

All specimens of *Maera quadrimana* in the Reish collections have stout basal articles on the last 3 pairs of pereopods, forming a perplexing exception to Schellenberg's otherwise neat separation of *M. pacifica* and *M. quadrimana*. I have no doubt that these specimens are *M. quadrimana* as seen in the figures of the gnathopods presented here. As there are no clear differences in the young of *M. pacifica*, one must rely on the length of the defining palmar tooth of gnathopod 2 in the young of both sexes, which is long in *M. pacifica* and short in *M. quadrimana*.

Key to the Females and Juveniles of *Maera*

1. Pleonal segment 4 with 2 sharp dorsal carinae . . . . . **M. insignis**
   Pleonal segment 4 smooth 2
2. Telson with notched apices 3
   Telson with blunt apices 4
3. Third pleonal epimeron smooth behind . . . . . **M. inaequipes**
   Third pleonal epimeron serrate behind . . . . . **M. inaequipes serratus**
4. Gnathopod 2, palm oblique . . . . . **M. othonopsis**
   Gnathopod 2, palm transverse 5
5. Adult males with 3 palmar teeth on gnathopod 2, young males, females and juveniles having smooth palms, with short defining tooth . **M. quadrimana**
   Adult males with one blunt palmer tooth on gnathopod 2, young males, females and juveniles having smooth palms, with long defining tooth . . . . . **M. pacifica**

Maera hamigera Haswell

FIGURE 16

Moera [sic] *hamigera* Haswell, 1879b, p. 333, pl. 21, fig. 1; 1882, pp. 254–255.
Megamoera suensis var., Haswell, 1885, p. 103, pl. 15, figs. 1–4.
Maera hamigera.—Stebbing, 1906, p. 437.—Walker, 1909, p. 335.—Stebbing, 1910b, pp. 600–601, 642.—K. H. Barnard, 1916, pp. 196–197, pl. 27, figs. 11–12.—Chilton, 1921, p. 73.

Diagnosis: No segments dorsally dentate; posterior edge of third pleonal epimeron serrate, lower edge smooth; uropod 3 extending much beyond uropods 1 and 2; palm of male gnathopod 2 distinct from hindedge of article 6; apices of telson notched; base of article 7 of male gnathopod 2 strongly curved.

Description: Eyes rather large, subreniform, ommatidia not closely packed; article 6 of one male gnathopod 2 (figure 16*k*) rather slender but very massive, palm nearly transverse but short, defined by a strong tooth bearing a large spine, palm with 2 or 3 teeth; other male second gnathopod (figure 16*j*) (usually the left one) very small, of similar shape but palm lacking defining tooth and bearing several large spines, article 7 not strongly curved at base; gerontic females having gnathopods similar to males (figures 16*a*, *f*); other adult females having both second gnathopods like the small one of gerontic females (figure 16*e*); smaller but still adult females having both second gnathopods small but the palm scarcely distinct from the hindmargin of article 6 (figure 16*m*); finally an aberrant form was found (figure 16*i*) having article 6 of gnathopod 2 stouter, the palm formed into about 7 small even teeth, and the finger swollen near its apex (see K. H. Barnard, 1916).

Thus there are five principal forms of this species in these collections.

Remarks: In light of the variability seen in this species and in my initial difficulty in identifying females of this species until males came to light, it is necessary to explore its relationship to such species

768-792—65——4

as *Maera mastersi* (Haswell) and *M. othonides* Walker. Complications arise because both species were inadequately described by their erectors. The first redescription of *M. mastersi* by Chilton (1916, lacking figures) caused some confusion to Schellenberg (1938a) for he reported that *M. othonides* and *M. mastersi* differed by the produced first coxa of *M. othonides* as contrasted with the rounded

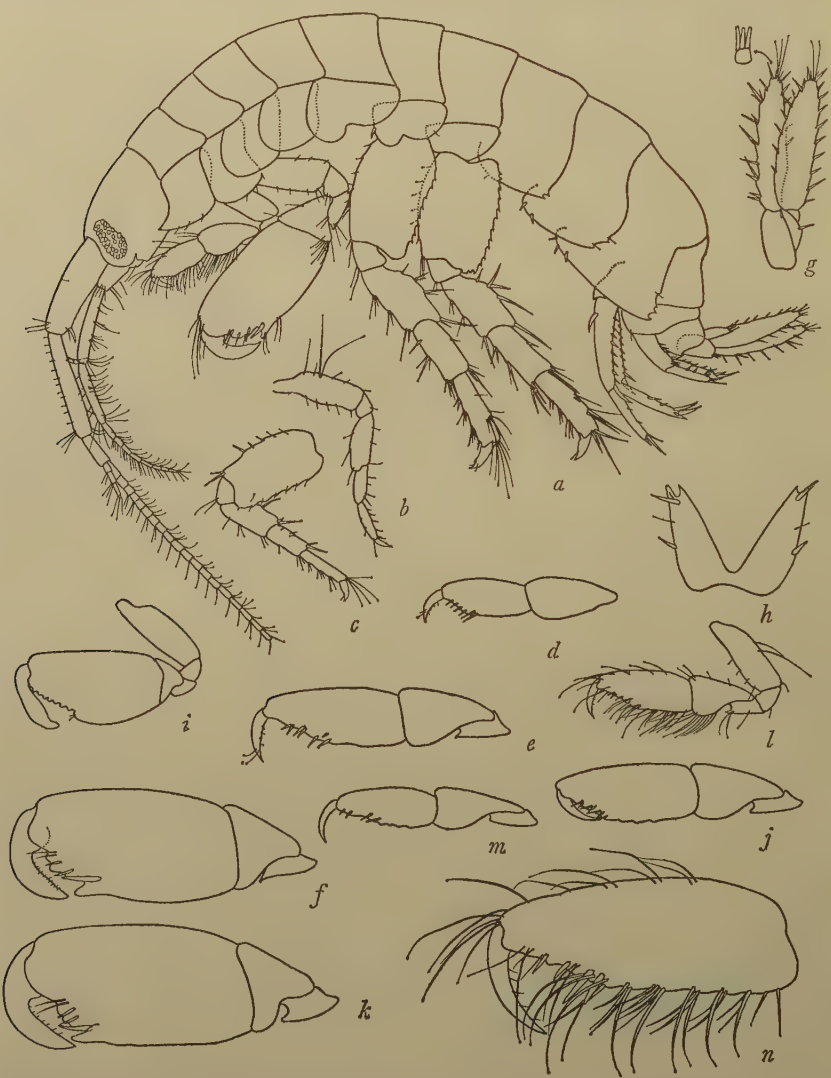

FIGURE 16.—*Maera hamigera* Haswell, female, 4.3 mm., Reish sta. E-40: *a*, lateral view; *b*, *c*, pereopods 1, 3; *d*, gnathopod 1; *e*, *f*, left and right second gnathopods; *g*, uropod 3; *h*, telson; aberrant specimen, 2.5 mm.: *i*, gnathopod 2; male, 5 mm.: *j*, *k*, gnathopods 1, 2; female: *l*, *m*, second gnathopods; female, 6 mm., Reish sta. E–163: *n*, gnathopod 2.

coxa of *M. mastersi* (this statement appears on p. 48 under *M. othonopsis*, new species). Chilton had written in his remarks that the first coxa was like that of *M. bruzelii* Stebbing (1888), which, if closely examined, appears to have the coxa acutely produced forward. Stebbing's (1906) description of *M. mastersi* was undoubtedly based on the poor original figures of Haswell (1879b). Although Sheard (1936) mentioned variability, his redescription of *M. mastersi* seems to fit most of Chilton's (1916) remarks except for the heavier palmar teeth of gnathopod 2. At this stage of the situation one must accept Sheard's figuring of the species as a starting point. In so doing, one is immediately struck with the similarity of that description with the redescription of *Maera othonides* Walker by Pirlot (1936), who relegated it to a new genus *Linguimaera*, since rejected. I am unable to see any qualitative differences between the two redescriptions. Walker (1904) originally figured only the uropods, telson, and third pleonal epimeron. Only in the telson can one find a discrepancy: Sheard described a telson with narrow lobes, evenly notched; Walker described narrow lobes quite asymmetrically notched. Chilton's (1916) description would seem to fit Walker's better than Sheard's, so we are left with the possibility that the telson varies to such extremes.

K. H. Barnard (1916) described but did not figure a specimen of *Maera mastersi* from South Africa in which one male gnathopod had rather strong and acute palmar teeth, especially having a distinct defining tooth; the other gnathopod was smaller, with the palm ill defined and lacking teeth. K. H. Barnard also described South African *Maera hamigera* with figures of two kinds of gnathopods, one of which is similar to the aberrant form herein described. The other gnathopod is in a somewhat intermediate condition between right and left gnathopods of adult males as herein described. I am not certain how he distinguished these specimens from his *M. mastersi*, since this intermediate second gnathopod fits his description of the *M. mastersi* gnathopod to a degree.

The variability seen in the present material makes necessary the suggestion that *Maera mastersi* and *M. othonides*, which themselves are most certainly closely related if not synonymous, may be growth stages of *M. hamigera*. This is vaguely contradicted by the fact that *M. mastersi* has been reported so many times previously but no worker has related it to *M. hamigera*. One may inspect Sheard's and Pirlot's drawings and still see minute differences in the gnathopodal palms between *M. mastersi* and *M. hamigera* and the writer leaves this as the only way to separate the species at present. In J. L. Barnard's (1962b) key to *Maera*, the species have been separated by considering only developed adult males, assuming that *M. mastersi* is such.

Material: Reish stations E–40 (7), E–41 (1), E–42 (5), E–43 (3), E–137 (1), E–163 (2).

Distribution: Australia, South Africa, Red Sea, in shallow waters to depths as great as 85 fathoms; Eniwetok Atoll, Marshall Islands.

Maera inaequipes (Costa)

Maera inaequipes (Costa).—J. L. Barnard, 1959, pp. 25–26, pl. 5 (with references).

Material: Abbott stations 72–G–3 (3), 160–165–J–5 (1); Reish station E–44 (7).

Remarks: These immature specimens have the typically notched telsonic apices and fit the figures of Chevreux and Fage (1925) relatively well. J. L. Barnard (1959) has written extensive comments on this species and its polymorphy; it is still questionable whether his Californian representatives of this species are truly *M. inaequipes* since the telson in that material has blunt apices; if such polymorphy is realistic, it then complicates the identification of the atoll material because the young *M. pacifica* segregated herein would be assigned to *M. inaequipes*. The life histories of these species need study by resident zoologists in the tropics.

Distribution: Cosmopolitan in tropical and warm-temperate.

Maera inaequipes serrata Schellenberg

Maera inaequipes serrata Schellenberg, 1938a, pp. 41–42, fig. 18.

Material: Abbott stations 40–E–3 (1), 42–F–2 (2), 76–H–3 (1), 81–B–4d (2), 113–H–2 (27), 116–F–3 (2), 125–D–3 (2), 126–C–4 (1), 141–D–3 (1), 142–E–4 (1), 144–F–2 (1), 179–184–M–1 (3); Reish stations E–28 (1), E–40 (6), E–42 (1), E–85 (1), E–137 (1), E–166 (1).

Distribution: Gilbert Islands; Ifaluk Atoll, Caroline Islands; Eniwetok Atoll, Marshall Islands.

Maera insignis (Chevreux)

Maera insignis (Chevreux).—Schellenberg 1938a, pp. 50–52, fig. 24.—J. L. Barnard. 1955, pp. 12–13.

Material: Abbott stations 22–D–5 (6), 23–E–2 (1), 24–C–1 (4), 26–F–2 (6), 27–F–1 (4), 28–D–3 (2), 29–C–1 (3), 30–C–4 (5), 31–D–2 (10), 32–G–3 (7), 39–E–5 (2), 40–E–3 (16), 41–D–3 (21), 42–F–2 (15), 44–D–3 (3), 46–E–2 (7), 48–E–1 (13), 49–E–2 (10), 50–E–1 (17), 66–E–10 (3), 69–E–7 (1), 83–E–1 (3), 91–E–2 (1), 128–C–5 (1); Bayer stations 431 (9), 589 (1); Reish stations E–75 (1), E–83 (1), E–137 (4), E–138 (1).

Distribution: Indo-Pacific: Seychelles, Chagos, Flores, Philippines, Micronesia, Fiji, Ellice, Hawaii.

Maera othonopsis Schellenberg

Maera othonopsis Schellenberg, 1938a, pp. 48–50, fig. 23.

Material: Abbott station 31–D–2 (1 ovigerous female); Reish station E–43 (1).

Distribution: Gilbert Islands; Ifaluk Atoll, Caroline Islands; Eniwetok Atoll, Marshall Islands.

Maera pacifica Schellenberg

Maera pacifica Schellenberg, 1938a, pp. 42–45, figs. 19, 20.

Material: Abbott stations 49–E–2 (4), 83–E–1 (7), 84–D–1 (2), 85–F–3 (1), 91–E–2 (10), 95–O–4 (1), 112–I–5 (1); Bayer station 431 (1); Reish station E–53 (9).

Remarks: None of the present specimens is sufficiently mature to reflect any of the taxonomic characteristics described or figured by Schellenberg. The materials have been identified by a process of elimination, since the structure of the telson and third uropods are not those of *M. inaequipes* or *M. quadrimana*. The third uropods bear short rami.

Distribution: Gilbert, Fiji, Hawaiian Islands; Ifaluk Atoll, Caroline Islands; Eniwetok Atoll, Marshall Islands.

Maera quadrimana (Dana)

FIGURE 17

Maera quadrimana (Dana).—Schellenberg, 1938a, pp. 45–48, figs. 21–22.—J. L. Barnard, 1955, p. 13.

Material: Abbott station 141–D–3 (1); Reish stations E–75 (1), E–77 (5), E–85 (9), E–88 (17).

FIGURE 17.—*Maera quadrimana* (Dana), female, 4.5 mm., Reish sta. E-85: *a*, gnathopod 2; *b*, pereopod 5; male, 5 mm., Reish sta. E-85: *c*, gnathopod 2.

Remarks: The juvenile specimen of 141–D–3 is referred to this species on the basis of the slender second articles of pereopods 3–5 on which the lower corners are quadrate (Schellenberg 1938a, figure 21g). Schellenberg adequately separated females and young of *M. quadrimana* and *M. pacifica*, which in adult males have different palmar sculpturing on the second gnathopods, by the narrow basal articles of pereopods 3–5 in *M. quadrimana* and the broad ones in *M. pacifica*. Dana's (1853) material had narrow basal articles; Schellenberg found several specimens of this kind and I have found one; however, the Reish specimens of *M. quadrimana* cited above have broad basal articles of those pereopods as figured herein; yet the specimens are unconfuted *M. quadrimana* because of their gnathopodal configurations. Schellenberg also found specimens of *M. quadrimana* with slightly broadened basal articles, suggesting that this species has several phenotypes respective to this character. *Maera pacifica* Schellenberg (1938a) may be simply another phenotype of *M. quadrimana* based on second gnathopods rather than on pereopods 3–5.

Distribution: Gilbert, Fiji, Hawaiian Islands; Ifaluk Atoll, Caroline Islands, Eniwetok Atoll, Marshall Islands.

Genus *Parelasmopus* Stebbing

Parelasmopus albidus (Dana)

Parelasmopus albidus (Dana).—Schellenberg, 1938a, pp. 61–62, fig. 32.

Material: Abbott station 141–D–3 (1 young).

Distribution: Gilbert Islands; Samoa; Ifaluk Atoll, Caroline Islands.

Parelasmopus resacus, new species

FIGURE 18

Diagnosis of male: No segment dorsally dentate or carinate; lateral lobes of head very broad, eyes large; accessory flagellum composed of one long article tipped with a smaller one; apex of maxillipedal palp article 3 tipped with a small granular bump; article 1 of mandibular palp scarcely longer than article 2, article 3 no longer than 2; palm of gnathopod 2 oblique, bearing a small tooth near hinge, a large medial process and a defining tooth, article 7 not reaching end of palm; coxae 1 and 2 each with a ventral serration; third pleonal epimeron with a tooth at lower hindcorner but not serrate on either hind- or ventral edges; telson short.

Female: Gnathopod 2 quite small.

Holotype: USNM 106878 male, 4 mm.

Type locality: Abbott station 145–C–3, Ifaluk Atoll, Oct. 21, 1953.

Material: Abbott stations 81–B–4d (17), 102–B–2 (6), 145–C–3 (2), 152–D–3 (2).

Relationship: This species differs from the other two of the genus, *P. suluensis* (Dana) and *P. albidus* (Dana) by the lack of dorsal segmental teeth. The mandibular palp is barely distinct from that of the genus *Maera* but article 1 is definitely elongated so that this species, therefore, is relegated to *Parelasmopus*.

Distribution: Ifaluk Atoll, Caroline Islands.

FIGURE 18.—*Parelasmopus resacus*, new species, holotype, male, 4 mm., Abbott sta. 145–C–3: *a*, lateral view; *b*, mandible; *c,d*, gnathopod 1; *e*, end of maxillipedal palp; *f*, end of gnathopod 2; *g–i*, pereopods 1, 3, 4; *j–l*, uropods 1, 2, 3; *m*, telson; female, 3.3 mm.: *n,o*, gnathopods 1, 2.

Beaudettiidae, new family

Diagnosis: Antenna 1 with small accessory flagellum; mandible lacking palp, with well developed triturating molar; upper lip truncate below; lower lip with inner lobes and acutely pointed mandibular processes; maxilla 1 with slender inner plate bearing a few terminal setae, palp biarticulate; maxilla 2 composed of 2 slender lobes, apically

setose only; maxilliped with inner and outer plates well developed, palp composed of four articles; gnathopod 2 larger than 1, article 3 of gnathopod 2 short; telson not distinctly split, slightly emarginate; uropod 3 with 2 rami; the inner one, half as long as the outer; all segments of urosome separate.

Type genus: *Beaudettia*, new genus.

Relationship: This unusual, although plain amphipod, combines the characteristics of several families. Superficially it appears to be in the Gammaridae or Photidae but has other characteristics of the superfamily Talitroidea (incl. Hyalidae).

The lack of a mandibular palp removes the genus from the Gammaridae and Photidae, but the presence of an accessory flagellum and inner lobes of the lower lip restrict it from the Talitroidea.

The antennae are those of the Gammaridae; the lateral head lobe and its notch are those of Gammaridae; the mandible is that of Talitroidea; the lower lip is that of the Photidae and Aoridae; both pairs of maxillae differ from those of any of the three mentioned families by the slender lobes; the maxilliped is not unique; the gnathopods could be those of either Gammaridae or Photidae but inconceivably of Talitroidea; the telson is rather unique, not fitting any of the mentioned families, but certainly closer to Photidae than the others; the third uropod is peculiar, like that of some Photidae but it could be one of the Gammaridae highly modified; the segregation of urosomal segments among numerous other criteria separates the family from the Dexaminidae.

If the species had a mandibular palp, I would place the genus in the Photidae but this would obscure its special characters such as the head lobe notch and the very slender maxillae, which resemble Gammaridae more than Photidae.

Beaudettia, new genus

Diagnosis: With the characters of the family.

Type species: *Beaudettia palmeri*, new species.

Beaudettia palmeri, new species

FIGURES 19, 20

Diagnosis: With the characters of the family.

Description: Article 2 of antenna 1 as long as article 1, article 3 two-thirds as long as article 2, accessory flagellum stout, short, composed of a long article tipped with a short one; antenna 1 much longer than antenna 2, the antennae otherwise resembling the genus *Elasmopus;* gnathopods rather like those of the genus *Elasmopus*, the palm of the second in the male undefined from the hindmargin of article 6, bearing a stout process toward the finger hinge, finger

FIGURE 19.—*Beaudettia palmeri*, new species; holotype, male, 3.3 mm., Reish sta. E–20: *a*, lateral view with enlarged accessory flagellum shown; *b*, gnathopod 1; *c–e*, pereopods 3, 4, 5.

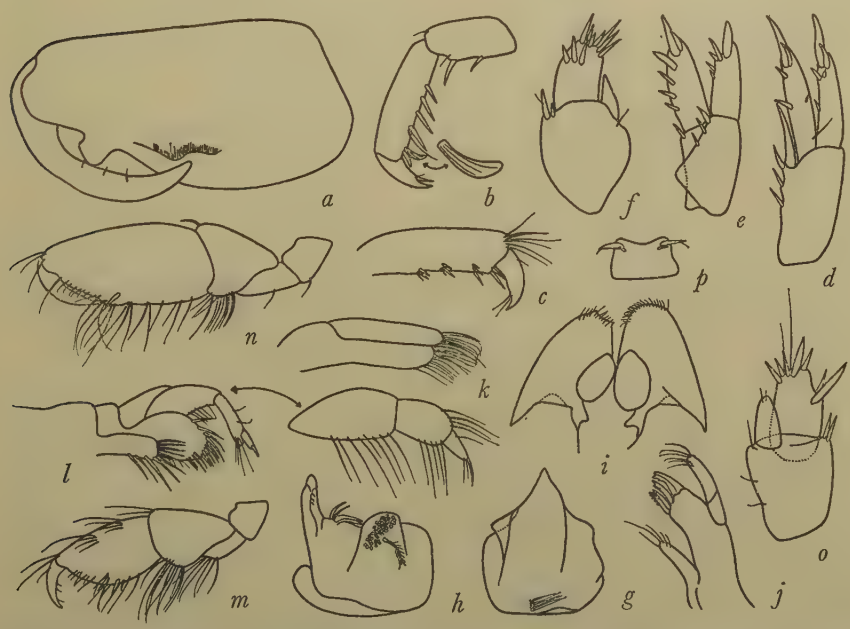

FIGURE 20.—*Beaudettia palmeri*, new species, holotype, male, 3.3 mm., Reish sta. E–20: *a*, gnathopod 2; *b,c*, ends of pereopods 1, 5; *d–f*, uropods 1, 2, 3; female, 2.5 mm.: *g*, upper lip; *h*, mandible; *i*, lower lip; *j,k*, maxillae 1, 2; *l*, maxilliped; *m,n*, gnathopods 1, 2; *o*, uropod 3; *p*, telson.

half as long as article 6, curved, with a small inner bump near base, hindedge of article 6 and palm fringed with long setae; coxa 4 only slightly concave on its hind edge; pereopods 1 and 2 with one or two large striated distal spines on article 6, like some species of *Hyale*.

Holotype: USNM 107572, male, 3.3 mm.

Type locality: Reish station E–120, Eniwetok Atoll, Sept. 7, 1956.

Material: 3 specimens from the type locality.

Remarks: In many respects this species resembles *Elasmopus ecuadorensis* or *E. pectenicrus*, from precursors of which this species might have evolved by loss of the mandibular palp, reduction of the inner ramus of uropod 3, shortening of the telson and the fusion of its lobes. This degeneration of morphological characters of an animal obviously stemming from the Gammaridae is most remarkable.

Distribution: Eniwetok Atoll, Marshall Islands.

Family Hyalidae

The genus *Parallorchestes* Shoemaker (1941) is not a synonym of *Parhyale*, as followed by Bulycheva (1957); in fact, according to her partitioning of the Talitridae into three families, Talitridae, Hyalidae, and Hyalellidae, the genus *Parallorchestes* by its possession of a biarticulate first maxillary palp should be removed from the genus *Parhyale* in the Hyalidae to the Talitridae proper. There it differs from the four known genera *Talitrus*, *Talorchestia*, *Orchestia*, and *Orchestoidea* by its biramous third uropod, the inner ramus being very small. The genus *Neobule*, poorly described and unrecovered since its description by Haswell (1879a) is not assignable, as yet, to any family.

Bulycheva's redescription of *Parhyale zibillina* contradicts Shoemaker's (1956) note that the species might belong to *Parallorchestes;* with its simple first maxillary palp it belongs with *Parhyale* in the family Hyalidae.

Genus *Hyale* Rathke

With 43 valid species and 15 dubious species, this genus poses problems of identification because of its simplified morphology and the lack of ornamentation.

Principal features of specific morphological variation lie in the lengths of the antennae, the stoutness of antenna 2, the shapes of the gnathopods, and the presence or absence of stout striated spines on the sixth articles of pereopods 1–5.

Defects in classification lie in the poor knowledge of growth stages particularly in species such as *H. macrodactyla* and *H. chevreuxi* where the adult male second gnathopods have palms confluent with the hindmargins of article 6 and possibly develop this condition from

younger stages having distinct oblique palms (see Schellenberg 1939). Another problem is whether the shapes of the first two coxae always have been determined properly, for some species have coxae with slight posterior lobes or processes and others do not. These would be useful characters if they can be verified in each species.

The following key to *Hyale* is simply a survey of the literature and suffers the defects of such compilation without access to materials of each species. Following it are notes concerning additional changes since J. L. Barnard's Index (1958).

Key to Male *Hyale*

1. Eyes absent, ramus of uropod 3 short, antennae subequal, pereopod 5 very elongated 2
   Eyes present, other characters not in this combination 3
2. Gnathopod 2 of female like that of male, large and well developed. **H. jeanelli**
   Gnathopod 2 of female, with short and distally broadened sixth article. **H. incerta**
3. Body dorsally carinate . . . . . **H. carinata**
   Body not dorsally carinate 4
4. Antenna 2 longer than body . . . . . **H. campbellica**
   Antenna 2 shorter than body 5
5. Finger of gnathopod 1 strongly furcate . . . . . **H. diplodactyla**
   Finger of gnathopod 1 not furcate 6
6. Article 6 of gnathopod 1 with anterior hump . . . . . **H. galateae**
   Article 6 of gnathopod 1 smooth on anterior margin 7
7. Dactylus of pereopods 1–5 with very large accessory seta near inner base . 8
   Dactylus of pereopods 1–5 with medium-sized to small seta near middle or absent 10
8. Palm of gnathopod 2 distinct from hindmargin of article 6 9
   Palm of gnathopod 2 not distinct from hindmargin of article 6. **H. ramalhoi**
9. Coxa 1 bearing a hindlobe . . . . . **H. spinidactyla**
   Coxa 1 lacking a hindlobe . . . . . **H. spinidactyloides**
10. Article 6 of pereopods 1–5 with a long stout striated distal spine on inner margin, the spine larger than neighboring spines 11
    Article 6 of pereopods 1–5 with short or slender, usually unstriated distal spine on inner margin, not larger than other spines 21
11. Palm of gnathopod 1 transverse 12
    Palm of gnathopod 1 oblique 13
12. Hindmargin of article 6 on gnathopod 2 longer than palm . . . **H. pontica**
    Hindmargin of article 6 on gnathopod 2 scarcely existent, palm nearly contiguous with it . . . . . **H. maroubrae**
13. Article 6 of gnathopod 2 with large hindtooth . . . . . **H. dentifera**
    Article 6 of gnathopod 2 lacking large hindtooth 14
14 Palm of gnathopod 2 distinct from hindmargin of article 6 15
    Palm of gnathopod 2 continuous with hindmargin of article 6 19
15. Palm of gnathopod 1 broadly expanded, defined by a large bump. **H. affinis**
    Palm of gnathopod 1 scarcely expanded, not defined by a large bump . . 16

16. Hindmargin of article 6 on gnathopod 2 quite short, palm with two bumps. **H. pusilla**
    Hindmargin of article 6 on gnathopod 2 almost as long as palm, palm lacking distinct bumps 17
17. Palm of gnathopod 1 40% as long as hindmargin of article 6 . **H. pygmaea**
    Palm of gnathopod 1 more than 70% as long as hindmargin of article 6 . 18
18. Palm of gnathopod 2 not defined by spines . . . . . **H. media**
    Palm of gnathopod 2 defined by 2 spines . . . . . **H. saldanha** (in part)
19. Palm of gnathopod 2 with one or more bumps 20
    Palm of gnathopod 2 lacking bumps . . . . . **H. honoluluensis**
20. Palmar bump of gnathopod 2 one-third of the palmar distance from finger hinge . . . . . **H. macrodactyla**
    Palmar bump of gnathopod 2 at finger hinge . . . . . **H. chevreuxi**
21. Gnathopod 2 with cuplike hollow lined with setae on medial surface of palm. **H. grenfelli**
    Gnathopod 2 lacking cuplike hollow 22
22. Finger of gnathopod 2 apically inflated . . . . . **H. diastoma**
    Finger of gnathopod 2 tapering distally 23
23. Hindmargin of article 6 on gnathopod 2 extremely short or heavily setose. **H. hirtipalma**
    Hindmargin of article 6 on gnathopod 2 not short or not heavily setose . . 24
24. Article 6 of pereopods 4–5 with spines or setae on hindmargin 25
    Article 6 of pereopods 4–5 smooth behind 26
25. Coxa 2 rounded behind . . . . . **H. prevosti**
    Coxa 2 with hindlobe . . . . . (see notes) **H. iwasai**
26. Antenna 2 "short" (use both halves of couplet) 27
    Antenna 2 "long" 30
27. Finger of pereopods 1–5 pectinate . . . . . **H. grandicornis**
    Finger of pereopods 1–5 not pectinate 28
28. Antenna 2 very slender, gnathopod 2 with palmar process near finger hinge. **H. grimaldi**
    Antenna 2 stout, gnathopod 2 lacking palmar processes 29
29. Antenna 2 lacking dense setal tufts . . . **H. crassicornis** and **H. bishopae**
    Antenna 2 with dense setal tufts . . . . . **H. plumulosa**
30. Distal finger setule large on pereopods 1–5 . . . . . **H. perieri**
    Distal finger setules weak or absent on pereopods 1–5 31
31. Finger of maxilliped with long apical seta or setae. **H. camptonyx** and **H. rubra**
    Finger of maxilliped with short or no apical setae 32
32. Palm of gnathopod 2 defined by 2 large spines . . . **H. saldanha** (in part)
    Palm of gnathopod 2 defined by 1 small or no spine 33
33. Hand of gnathopod 1 expanding distally, broad 34
    Hand of gnathopod 1 rectangular, not expanding distally . . . . **H. nigra**
34. Palm of gnathopod 1 defined by spine and large bump . . . . **H. dollfusi**
    Palm of gnathopod 1 not defined by spine and bump . . . . **H. schmidti**

NOTES.—Bulycheva (1957) refers *Hyale carinata* to *H. pontica* but the female gnathopods of *H. carinata* as figured by Chevreux and Fage (1925) differ from those figured for *H. pontica* both by Sars (1895) and Chevreux and Fage (1925).

Hyale antares Oliveira (1953): only the female is known; it belongs to the group of Hyales having a large, striated distal spine on article 6 of pereopods 1–5.

Hyale bassaringi Derjavin→*Hyale novaezealandiae*→*Hyale grandicornis* by Bulycheva (1957) and Hurley (1957).

Hyale wolffi Reid (1951) is related to *H. media* and *H. pygmaea* but the condition of coxae 1 and 2 is unknown.

Hyale pugettensis (Dana): not well enough described for inclusion.

Hyale iwasai Shoemaker (1956) (=*H. gracilis* Iwasa 1939) probably is a synonym of *Parhyale hawaiensis*. See that species herein and in Shoemaker (1956) for notes.

Hyale saldanha Chilton (1912, see K. H. Barnard 1916) requires two places in the key because it has a short but heavily serrated spine on pereopods 1 and 2, according to K. H. Barnard.

Hyale graminea (Dana): unclear, close to *H. honoluluensis*, *H. macrodactyla*, *H. chevreuxi*, and *H. hirtipalma*.

Hyale goetschi Schellenberg, possibly a female.

Hyale changi Chen, reference not available.

Hyale frequens (Stout)→*H. nigra* by J. L. Barnard 1962c.

Hyale chevreuxi K. H. Barnard

FIGURE 21

Hyale macrodactylus Chevreux, 1901, pp. 397–399, figs. 13–14 (not *H. macrodactylus* Stebbing, 1899).—Walker, 1909, p. 337.
Hyale chevreuxi K. H. Barnard, 1916, p. 235 (new name).
Hyale chevreuxi.—Schellenberg, 1938a, pp. 68–69, fig. 35a.

Material: Reish stations E–74 (11), BE–102 (8).

Remarks: None of these specimens quite matches that figured by Chevreux (1901) because the male palms of gnathopod 2 are some-

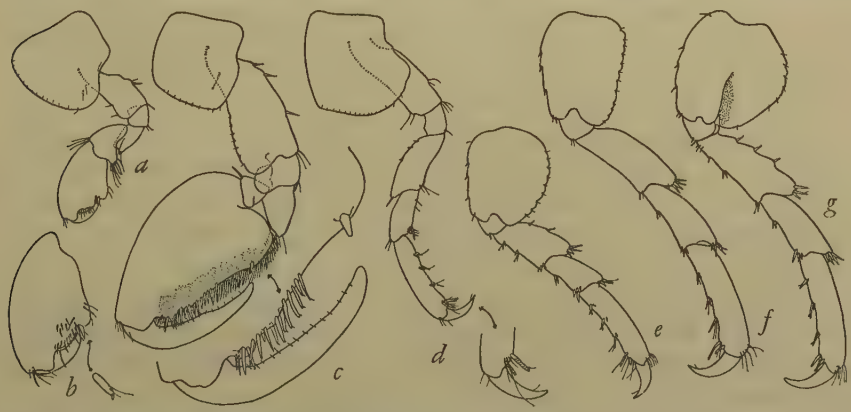

FIGURE 21.—*Hyale chevreuxi* K. H. Barnard, male, 4.2 mm., Reish sta. E–102: *a,b*, gnathopod 1; *c*, gnathopod 2; *d–g*, pereopods 2–5.

what shorter and marked by a large articulated spine and the finger is much shorter. Probably these males are one instar younger than the adult figured by Chevreux, but the life history should be studied to confirm this. Because an apparent young male has a second gnathopod rather like that of any young *Hyale*, such as *H. media*, identification of juvenile males may be impossible.

Distribution: Seychelles and Chagos Archipelagos; Gilbert Islands; Eniwetok Atoll, Bikini Atoll, Marshall Islands.

Hyale dentifera Chevreux

Hyale dentifera Chevreux, 1907, pp. 414–415; 1908, pp. 499–503, figs. 18–20.

Material: Reish stations E–72 (5), E–73 (2), BE–101 (1).

Distribution: Gambier Archipelago; Eniwetok and Bikini Atolls, Marshall Islands.

Hyale honoluluensis Schellenberg

FIGURES 22, 23

Hyale honoluluensis Schellenberg, 1938a, pp. 69–71, figs. 35b,c.—J. L. Barnard, 1955, p. 18.

Material: Reish stations E–21 (1), E–38 (5), E–50 (4), E–68 (16), E–93 (10), BE–101 (10), E–116 (8), E–118 (9), E–140 (7), E–171 (4).

Remarks: The spines on the palm of the second gnathopod are much stouter than figured by Schellenberg and the palm of the first gnathopod is defined by a large spine.

Distribution: Hawaiian Islands; Eniwetok Atoll, Marshall Islands.

Hyale media (Dana)

Hyale media (Dana).—Stebbing, 1906, pp. 569–570.—Shoemaker, 1935, pp. 243–244.—Schellenberg, 1939, pp. 128–129.—Stephensen 1949, pp. 37–41, figs. 16–17.—Ruffo, 1950, pp. 60–62, figs. 4 (5–10), 5.—Oliveira, 1953, 344, pl. 17.—Ruffo, 1956, pp. 213–215.—Hurley, 1957, pp. 916–919, figs. 72–90.
Hyale ayeli J. L. Barnard, 1955, pp. 14–15, fig. 7.

Material: Reish stations E–73 (4), E–77 (4), E–94 (8), BE–101 (22).

Remarks: Apparently *Hyale ayeli* is an excessively setose form of this species. When described, it was compared with figures of *H. media* published by Stephensen (1949) wherein no setae are present on the hindmargin of article 5 of antenna 2; since then, Ruffo (1956) has called attention to the resemblance of *H. ayeli* to a form of *H. media* figured by him (Ruffo, 1950) from Venezuela having a moderate number of posterior setae; Hurley (1957) also shows small posterior bundles of setae.

The specimens identified herein have virtually no setae on the antennal peduncles. Most of the specimens are smaller than 3.8 mm.

in length. In Reish station E–101, the only male larger than that size (with a length of 4.5 mm.) has gnathopod 1 with the distal part of article 6 somewhat widened, approaching *Hyale affinis* Chevreux (1908). Possibly *Hyale affinis* is the terminal adult of *H. media* but the present materials show only this one case and others should be discovered before a decision can be made.

Distribution: Pantropical; recorded here from Eniwetok and Bikini Atolls, Marshall Islands.

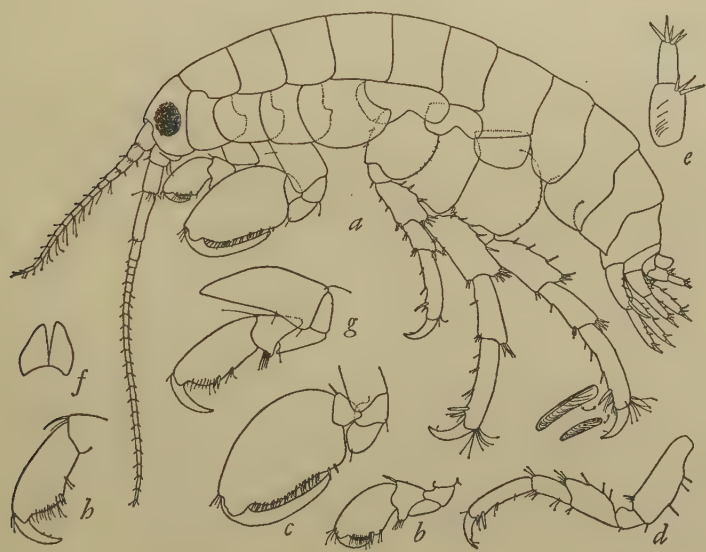

FIGURE 22.—*Hyale honoluluensis* Schellenberg, male, 4.8 mm., Reish sta. E–101: *a*, lateral view; *b,c*, gnathopods 1, 2; *d*, pereopod 1; *e*, uropod 3; *f*, telson; female, 4 mm., *g,h*, gnathopods 1, 2.

Genus *Parhyale* Stebbing

Parhyale hawaiensis (Dana)

FIGURE 24

Parhyale hawaiensis (Dana).—Shoemaker, 1956, pp. 351–357, figs. 3, 4 (with references).—Ruffo 1959, pp. 17–18.
Parhyale inyacka (K. H. Barnard).—J. L. Barnard, 1955, p. 23, fig. 12.

Material: Abbott stations 51–C–2 (4), 53–B–3 (3), 55–C–3 (5), 83–E–1 (1), 91–E–2 (11), 197–198–F–1 (25); Hand station CH–609 (6); Bayer station 800 (1); Reish station ME–62 (4).

Remarks: All specimens except those from the Reish station typically possess a distinctly articulated inner ramus of uropod 3 as figured by Shoemaker (1956); however, the 4 Reish specimens have simply a small, scarcely perceptible, firmly fused process, with no lines of demarcation representing the inner ramus of uropod 3.

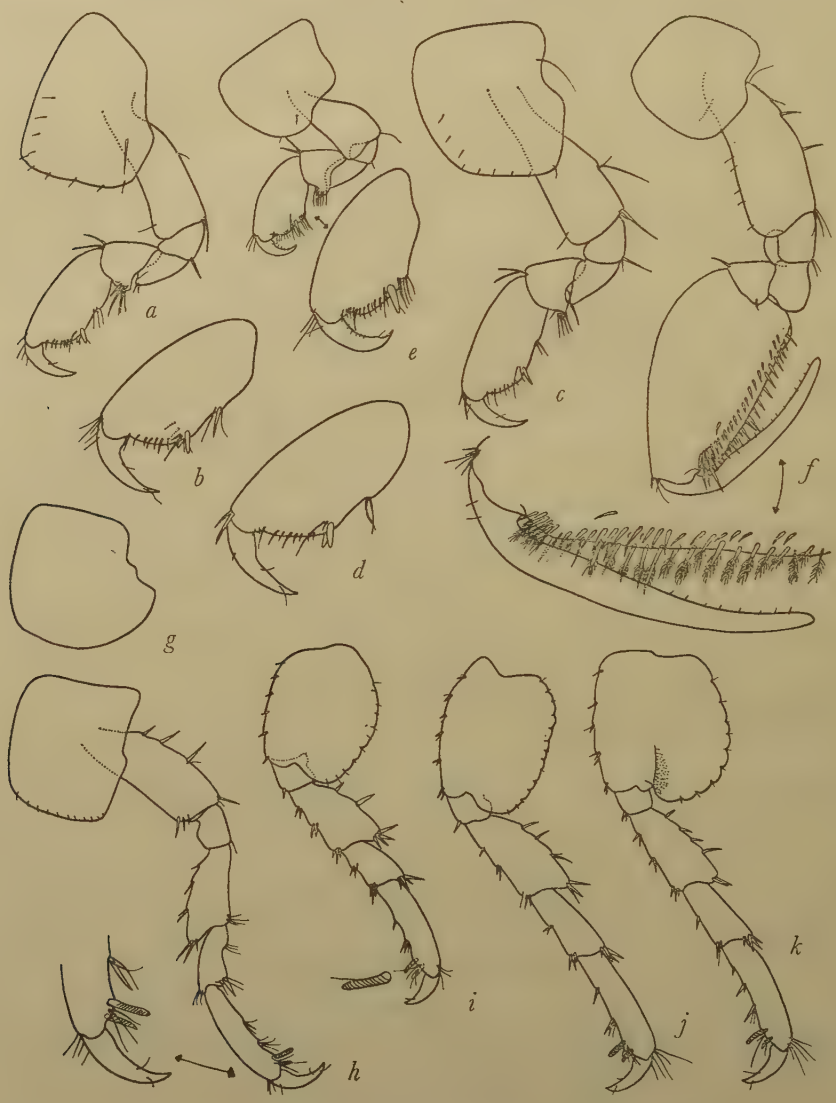

FIGURE 23.—*Hyale honoluluensis* Schellenberg, female, 3 mm., Reish sta. E–68: *a,b*, gnathopod 1; *c,d*, gnathopod 2; male, 4.2 mm., Reish E–118: *e,f*, gnathopods 1, 2; *g*, coxa 4; *h–k*, pereopods 1, 3, 4, 5.

Technically the specimens should be placed in the genus *Hyale* but all other features are definitely those of *P. hawaiensis*, including female second gnathopods with a process on article 2. The only species in *Hyale* to which these specimens might be keyed is *H. iwasai* (=*H. gracilis Iwasa* 1939), which Shoemaker (1956) has suggested might be *P. hawaiensis*. I concur with Shoemaker's suggestion. The

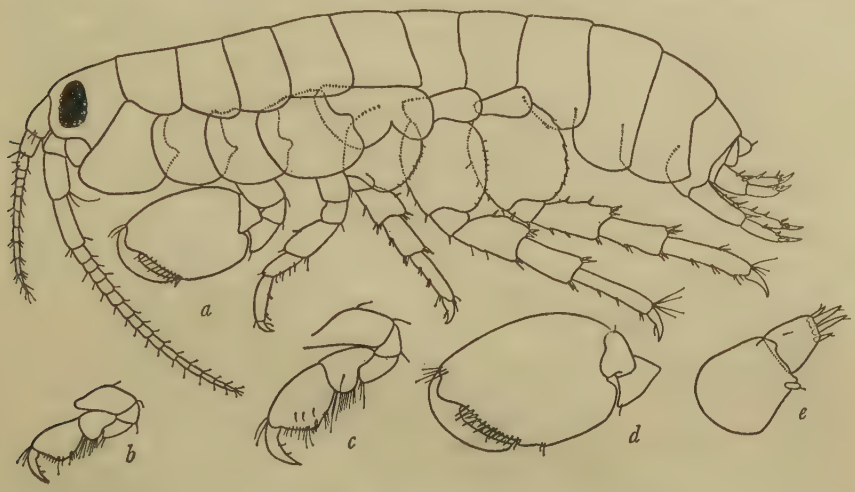

FIGURE 24.—*Parhyale hawaiensis* (Dana), male, 4 mm., Reish sta. E–62: *a*, lateral view, less uropod 3; *b*,*c*, gnathopod 1; *d*, gnathopod 2; *e*, uropod 3.

only difference in the two forms is the presence of a lateral spine on the ramus of uropod 3 in *H. iwasai* and a more slender uropod 3; the distal process of article 2 of the female gnathopod 2 also is poorly developed.

It is necessary to keep in mind that some specimens of *P. hawaiensis* have a fused inner ramus of uropod 3 and they must be detected in other ways. Shoemaker's analysis of the species is exemplary and should be used as the model for comparison.

Distribution: Pantropical and warm-temperate.

Family Dexaminidae

Genus *Dexaminoides* Spandl

Dexaminoides orientalis Spandl

FIGURE 25

Dexaminoides orientalis Spandl, 1924, pp. 56–59, figs. 21, 22.—Schellenberg, 1928, pp. 653–655, fig. 202.

Material: Abbott stations 124–D–3 (1), 125–D–3 (3).

Remarks: Schellenberg (1928) has corrected several errors originally made by Spandl and has described the mouthparts.

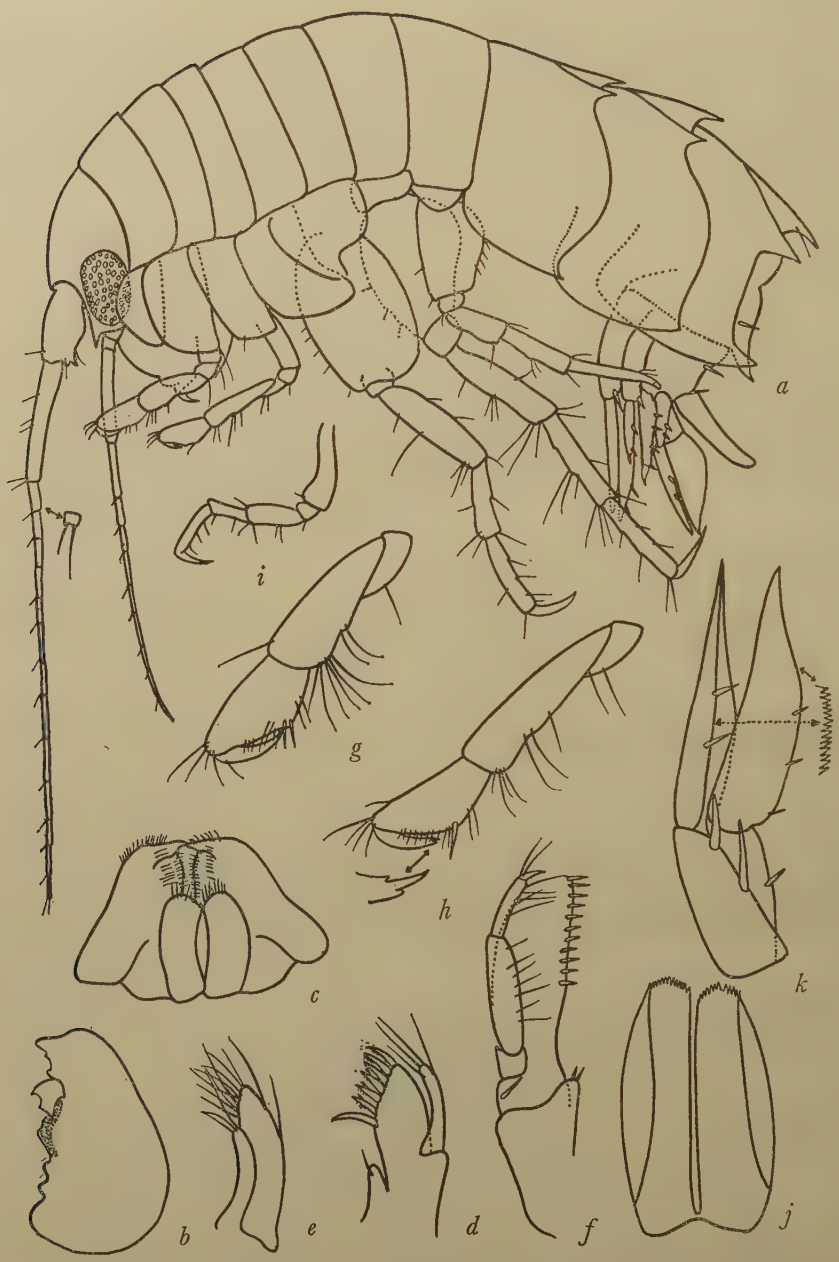

FIGURE 25.—*Dexaminoides orientalis* Spandl, female, 2 mm., Abbott sta. 125-D-3: *a*, lateral view; *b*, mandible; *c*, lower lip; *d*,*e*, maxillae 1, 2; *f*, maxilliped; *g*,*h*, ends of gnathopods 1, 2; *i*, pereopod 1; *j*, telson; juvenile, 1.6 mm.: *k*, uropod 3.

The species is figured again herein to give all the mouthparts in perspective and to add a figure of the third uropod.

The specimens at hand differ from the original description in one important point, possibly of subspecific value: the greatly produced tooth on the lower corner of the third pleonal epimeron. I hesitate to erect a new species on this basis because dexaminids are known to vary greatly (witness *Polycheria antarctica*) and the original description may have been in error, although Schellenberg (1928) makes no mention of it.

Distribution: Red Sea; Ifaluk Atoll, Caroline Islands.

Family Aoridae

Genus *Lembos* Bate

Key to the Males

1. Posterodistal end of article 2 on gnathopod 1 with a brush of setae (6 or more setae) 2
   Posterodistal end of article 2 on gnathopod 1 lacking a brush of setae . . 5
2. Pereopod 2 with a strongly setose fourth article . . . . . **L. hirsutipes**
   Pereopod 2 with a poorly setose fourth article 3
3. Pereopod 1 with a strongly setose fourth article . . . . . **L. megacheir**
   Neither pereopods 1–2 with strongly setose fourth articles 4
4. Palm of gnathopod 1 oblique and bearing a sharp medial tooth . **L. longipes**
   Palm of gnathopod 1 transverse, slightly chelate, lacking medial process. **L. arcticus**
5. Coxa 1 distinctly rounded at anteroventral corner 6
   Coxa 1 pointed at anteroventral corner 14
6. Article 6 of gnathopod 1 essentially bifid, forming a large tooth on posterior edge . . . . . **L. jassopsis**
   Article 6 of gnathopod 1 not bifid in this manner 7
7. Article 4 of gnathopod 2 with acute hindprocess 8
   Article 4 of gnathopod 2 lacking acute hindprocess 9
8. Article 2 of gnathopod 2 inflated, article 3 with sharp anterior process. **L. bryopsis,** new species
   Article 2 of gnathopod 2 slender, article 3 not produced . . . **L. hastatus**
9. Article 5 of gnathopod 1 less than one third as long as article 6 10
   Article 5 of gnathopod 1 more than half as long as article 6 11
10. Palm of gnathopod 1 transverse, slightly chelate, article 6 slender. **L. chelatus**
    Palm of gnathopod 1 oblique, defining tooth not reaching a transverse line from hinge, article 6 stout . . . . . **L. processifer**
11. Palm of gnathopod 1 strongly excavate, with large defining tooth. **L. philacanthus**
    Palm of gnathopod 1 not excavate, defining tooth small or absent . . . 12
12. Gnathopod 1, anterior and posterior edges of article 6 nearly parallel. **L. tetracanthus**
    Gnathopod 1, article 6 inflated, anterior and posterior edges biconvex . . 13
13. Palm of gnathopod 2 long, article 7 about as long as hindmargin of article 6. **L. francanni**

Palm of gnathopod 2 short, article 7 about half as long as hindmargin of article 6 . . . . . **L. smithi**

14. Article 6 of gnathopod 1 essentially bifid, with large proximal posterior tooth . . . . . **L. podoceroides**
Article 6 of gnathopod 1 not bifid 15

15. Article 2 of gnathopod 2 strongly inflated . . . . . **L. kergueleni**
Article 2 of gnathopod 2 slender, edges subparallel 16

16. Article 6 of gnathopod 2 slightly chelate and longer than article 5. **L. gambiense**
Article 6 of gnathopod 2 not chelate 17

17. Anterior edge of article 5 of gnathopod 1 densely setose . . . **L. websteri**
Anterior edge of article 5 of gnathopod 1 poorly or not setose 18

18. Distal anterior corner of article 2 on gnathopod 2 with process 19
Distal anterior corner of article 2 on gnathopod 2 lacking process 20

19. Defining tooth of gnathopod 1 not set apart from palm . . **L. hypacanthus**
Defining tooth of gnathopod 1 set apart from palm by excavation. **L. concavus**

20. Palm of gnathopod 1 distinctly transverse (see notes) 21
Palm of gnathopod 1 oblique 22

21. Article 7 of gnathopod 1 with inner bump, ventrum of pereon with 4 large and 2 small posteriorly projecting teeth . . . . . **L. audbettius**
Article 7 of gnathopod 1 lacking inner bump, ventrum of pereon with 2 anteriorly projecting teeth . . . . . **L. macromanus**

22. Eyes absent, coxae very small 23
Eyes present, coxae of normal size 24

23. Pereopod 4 reaching to end of article 4 on pereopod 5 . . . . . **L. lobata**
Pereopod 4 reaching to end of article 5 on pereopod 5 . . **L. longidigitans**

24. Gnathopod 2 quite slender, article 6 nearly twice as long as article 5. **L. leptocheirus**
Gnathopod 2 not markedly slender, article 6 subequal to article 5 in length. 25

25. Palm of gnathopod 1 lacking medial process or one near finger hinge, palm excavate and with defining tooth 26
Palm of gnathopod 1 bearing either a medial process or one near finger hinge. 27

26. Ventrum of pereon garnished with numerous spines . . . . **L. spiniventris**
Ventrum of pereon lacking spines . . . . . **L. viguieri**

27. Article 7 of gnathopod 1 overlapping palm by almost half its length. **L. aequimanus**
Article 7 of gnathopod 1 scarcely overlapping palm 28

28. Medial palmar process of gnathopod 1 formed into a distinct blunt lobe. **L. fuegiensis**
Medial palmar process of gnathopod 1 indistinct but sharp . **L. intermedius**

NOTES.—References to species may be consulted in J. L. Barnard's (1958) Index. Other species described since then: *L. audbettius* J. L. Barnard (1962a); *L. lobata* J. L. Barnard (1962d).

Lembos tetracanthus might be the young of *L. francanni*.

L. teleporus K. H. Barnard, 1955: coxa 1 and article 4 of gnathopod 2 not described; keys out either to couplets 7, 9, or 25 but is distinguished from those relatives by gnathopod 1 for which the original drawing should be checked.

Couplet 20: "transverse" indicates an imaginary line from the hinge perpendicular to the long axis of article 6, measured from the middle of the proximal joint to the middle of the palm.

Lembos aequimanus Schellenberg

FIGURE 26

Lembos (*Bemlos*) *aequimanus* Schellenberg, 1938a, pp. 76–77, fig. 39.

Material: Reish stations E–40 (1), E–49 (1), BE–104 (1).

Remarks: Specimens from the last two stations seem to fit this species although they are in poor condition. The female from station E–40 was found associated with the male of the new species *L. bryopsis* (p. 528) and it is debatable whether it is the female of that species or belongs with *L. aequimanus*. If indeed it is the female of *L. bryopsis*, then the females of both *L. bryopsis* and *L. aequimanus* seem identical; on the other hand, this female lacks any of the distinctive characters of *L. bryopsis*. It is scarcely conceivable that Schellenberg's male of *L. aequimanus* was indeed the juvenile of *L. bryopsis* since so many differences are apparent.

FIGURE 26.—*Lembos aequimanus* Schellenberg, female, 3.8 mm., Reish sta. E–40: *a,b*, gnathopods 1, 2.

Separation of young animals of *L. intermedius* and *L. aequimanus* should be difficult, for *L. aequimanus* probably represents a stage in the development of *L. intermedius*. In the females at hand the differences between *L. intermedius and L. aequimanus* are as evident as they are between *L. processifer* and *L. aequimanus*, if one recalls that

L. processifer and *L. intermedius* differ only by the first coxa. Thus, some of the specimens identified as young male *L. processifer* may indeed be *L. aequimanus*, although the first coxae should be different.

Distribution: Fiji and Gilbert Islands; Eniwetok and Bikini Atolls, Marshall Islands.

Lembos bryopsis, new species

FIGURE 27

Diagnosis of male: Eyes rather small, removed from the edges of the lateral lobes; coxa 1 rounded at anterior lower corner; gnathopod 1 with article 5 one-fourth as long as article 6, the latter very elongated, with hindedge fully excavated, forming a false transverse palm by the projection of a large tooth at the distal end, proximal part of hindedge bearing a small triangular lobe, article 7 overlapping the false palm by more than half its length, bearing an inner proximal bump; article 2 of gnathopod 2 strongly inflated, article 3 bearing a sharp, slender anterior lobe, article 4 bearing a distally projecting acute posterior process, article 6 shorter than 5, palm poorly developed, oblique, bearing a defining spine; ventrum of pereonal segment 2 bearing a large sternal spine projecting posteriorly as seen on the lateral drawing of the animal.

FIGURE 27.—*Lembos bryopsis*, new species, holotype, male, 6 mm., Reish sta. E-40: *a*, lateral view; *b*, gnathopod 1; *c–e*, gnathopod 2; *f*, uropod 3; *g*, telson.

Mouthparts similar to those of *L. websteri* in Sars (1895, pl. 194). Uropod 3 with a small second article on the outer ramus; false lobes of telson quite erect but flattened in the drawing; peduncles of both first and second uropods with an apical ventral tooth, smaller in second uropod. All pereopods and most of antennae missing.

Holotype: USNM 107575, male, 6 mm. Unique.

Type locality: Reish station E–40, Eniwetok Atoll, Aug. 27, 1956.

Relationship: The only other species of *Lembos* bearing an inflated second article on gnathopod 2 is *L. kergueleni* (Stebbing 1888, pl. 111), but the new species differs from it markedly in the first gnathopod and the rounded first coxa.

No other known species of the genus has a first gnathopod similar to *L. bryopsis*.

A single female was associated with this male animal in Station E–40 but the writer considers that it belongs temporarily with *L. aequimanus*.

Distribution: Eniwetok Atoll, Marshall Islands.

Lembos processifer (Pirlot)

FIGURES 28 *g–m*

Bemlos processifer Pirlot, 1938, pp. 330–334, figs. 147–149.

Material: Abbott stations 31–D–2 (2), 76–H–3 (3), 124–D–3 (2), 128–C–5 (1), 160–165–J–5 (1), 176–G–4 (3), 177–G–5 (2), 179–184–M–1 (3); ? Reish station E–163 (1 female).

Remarks: Females and juveniles of this species have the enlarged sixth article of gnathopod 1 similar to the male, and article 5 is shortened, so that these animals are relatively easy to separate from females of *Microdeutopus tridens* (figure 27*f*).

Pirlot's (1938) figure 149 of the female second gnathopod is really the first gnathopod of a small female. In the present materials gnathopod 2 of the female is similar to that of the male gnathopod 2.

Lembos processifer and *L. intermedius* Schellenberg (1938a) appear identical except for the pointed first male coxa of *L. intermedius*. None of the specimens at hand shows any tendency to a pointed first coxa; because this feature is presently a necessary part of any key to *Lembos*, *L. intermedius* from the Hawaiian Islands and *L. processifer* from Micronesia and the Celebes are conserved; nevertheless, their life histories should be fully studied for evidence of intergradation and subspeciation.

For future reference it may be noted that *L. intermedius* was described in June of 1938 and *L. processifer* in October of 1938. The date of publication apparently is missing on Pirlot's paper, at least on the several copies from U.S. libraries available to the writer. The publisher, E. J. Brill, Ltd., Leiden, has kindly informed me that their records show October 1938 as the publication date of Pirlot's paper.

Distribution: Celebes; Ifaluk Atoll, Caroline Islands.

Lembos species

FIGURES 28*a–e*

cf. *Lembos francanni* Reid, 1951, pp. 254–255, fig. 46.

Material: Abbott stations 32–G–3 (1), 116–F–3 (5), 128–C–5 (1). ?Reish stations E–133 (1), E–169 (1), E–172 (3).

Remarks: Two minor differences are seen in the present specimens when compared with the description and figures by Reid from West

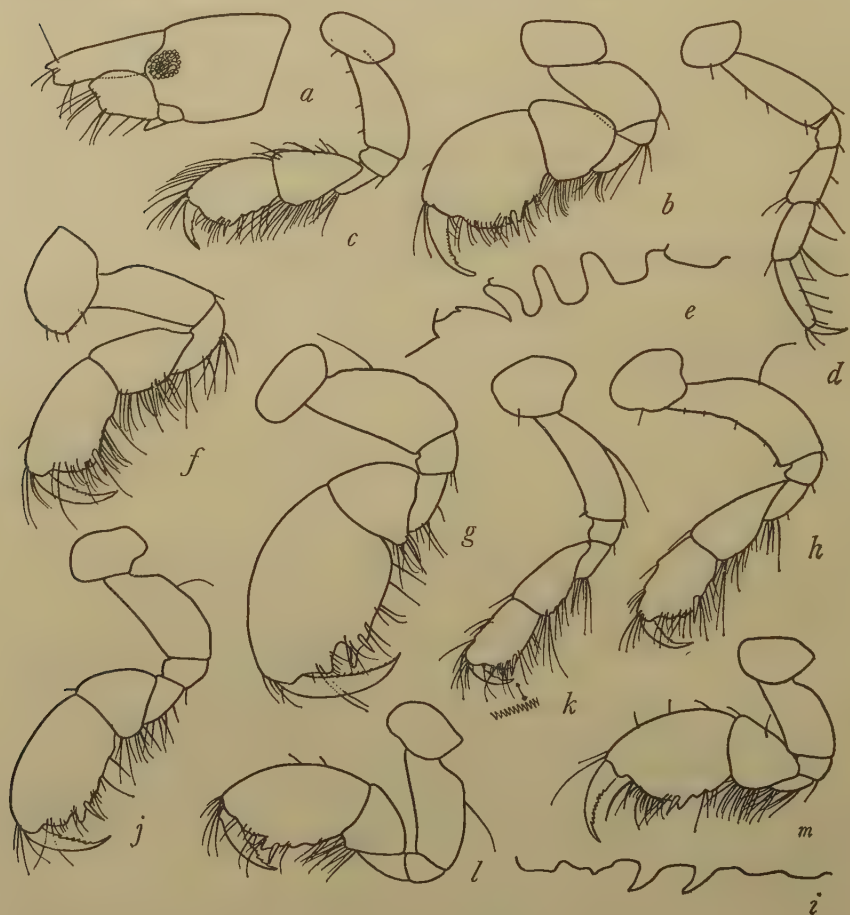

FIGURE 28.—*Lembos* species, male, 2.6 mm., Abbott sta. 116–F–3: *a*, head; *b,c*, gnathopods 1, 2; *d*, pereopod 1; *e*, ventral spination of peraeon segments 1–6. *Microdeutopus tridens* Schellenberg, female, 3.5 mm., Abbott sta. 31–D–2: *f*, gnathopod 1. *Lembos processifer* Pirlot, male, 3 mm., Abbott sta. 179–184–M–1: *g,h*, gnathopods 1, 2; male, 4 mm., Abbott sta. 176–G–4: *i*, ventral spination of peraeon segments 1–6; male, 3 mm. Abbott sta. 179–184–M–1: *j,k*, gnathopods 1, 2; male, 2.75 mm., Abbott sta. 179–184–M–1: *l*, gnathopod 1; female, 2.5 mm., Abbott sta. 176–G–4: *m*, gnathopod 1.

Africa: (1) the lack of an anterodistal process on article 2 of gnathopod 2, perhaps due to immaturity, and (2) the spinose inner edges of the dactyls on both gnathopods, perhaps overlooked by Reid. The male has a spiniform median keel on the sternites, commencing on segment 1 and ending on segment 5, with a slight keel on segment 6, as drawn.

It is impossible to separate females of this species from females of *L. processifer* as herein identified, and only where males of *Lembos* species have occurred can some distinction be made between the species. Essentially, the males of this species resemble large females of *L. processifer* except for the ventral keel and lack of brood plates; that these specimens are not simply aberrant intersexes of *L. processifer* is demonstrated by the difference in ventral keels as seen in the accompanying drawings.

Distribution: Ifaluk Atoll, Caroline Islands; Eniwetok Atoll, Marshall Islands.

Genus *Microdeutopus* Costa

Microdeutopus tridens Schellenberg

FIGURE 28*f*

Microdeutopus tridens Schellenberg, 1938a, pp. 74–75, fig. 38.

Material: Abbott stations 31–D–2 (2), 32–G–3 (1), 40–E–3 (1), 41–D–3 (2), 42–F–2 (1), 81–B–4–d (4), 112–I–5 (1), 113–H–2 (10), 126–C–4 (3), 132–E–4 (1), 136–C–4 (1), 137–E–6 (9), 138–E–4 (4), 141–D–3 (2), 146–151–H–4 (1), 155–157–G–1 (2), 158–159–D–5 (7), 167–D–4 (3), 176–G–4 (4), 177–G–5 (8), 179–184–M–1 (35), 192–D–6 (2); Bayer stations 592 (1), 754 (1); Reish station E–24 (1).

Remarks: The female first gnathopod is drawn for comparison with that of female *Lembos processifer* (figure 27 *m*).

Distribution: Gilbert Islands; Ifaluk Atoll, Caroline Islands; Eniwetok Atoll, Marshall Islands.

Family Photidae

Genus *Eurystheus* Bate

Audulla Chevreux, 1901, pp. 431–432. [New synonymy.]
Eurystheus Bate.—Stebbing, 1906, p. 610.

Such multispecific genera have always caused difficulty to taxonomists, especially because of apparent intraspecific polymorphism. Notably this has been true of the species *E. atlanticus* (Stebbing 1888) and *E. afer* (Stebbing 1888). As originally described and figured by him, they seemed to be clearly distinct although, at the time, Stebbing thought they might be varieties of a single species. *Eurystheus afer* bears short lateral head lobes, scarcely distinct from the front head

margins and only slightly attenuated below and distally, with an oblong eye filling the anterior part of the head fully along the anterior margin. *Eurystheus atlanticus* bears a strongly produced lateral head lobe with a lageniform eye, the lower part of the eye filling the lateral lobe and the neck reaching upward toward the top of the head. Since that time, the two species have been recorded frequently and a few more figures have been published but the interpretations have strayed far from the original interspecific concepts of the genus. It becomes practically impossible for the taxonomist to assign names to populations in areas other than the type locality, South Africa.

The two species, their varieties, and similar phenotypes have now been reported from as far east as Micronesia, half a world away from the type locality.

Stebbing's concept of differences based on eyes was destroyed by Tattersall (1922), who reported *E. atlanticus* with well-produced head lobes that mixed together specimens having oval eyes entirely confined to the lobes with specimens having lageniform eyes with a neck stretched up onto the head proper. Apparently the lageniform eye was associated with a terminal condition of adulthood. Chilton (1921) reported specimens with the lageniform necks nearly obsolete, but perhaps these should be considered as rudimentary necks just developing rather than becoming obsolete.

Walker (1909) decided that his *E. gardineri* and *E. zeylanicus* were synonyms of *E. atlanticus*, bringing in species with variable eyes or oval eyes confined to the head lobes. Thus, *E. afer* and *E. atlanticus* differed basically by the amount of forward production of the head lobe, *E. afer* with an oblong eye, *E. atlanticus* either with an oval eye confined to the large head lobe or with a neck extending onto the head.

Then Pillai (1957) figured both species, distinctly showing a difference in sizes of head lobes, with oval eyes for *E. atlanticus* and slightly oblong eyes for *E. afer*. Eyes of the latter species somewhat resembled a modified version of a lageniform eye intermediate between the original *E. atlanticus* and *E. afer* of Stebbing.

J. L. Barnard (1961) figured a specimen assigned to *E. afer* having head lobes similar to those of Stebbing's *E. afer* but with modified lageniform eyes as shown by Pillai.

Present materials provide an unusual population assignable to *E. atlanticus* and carrying well-produced head lobes, oval eyes, and male gnathopods within varietal extremes of *E. atlanticus*. Female gnathopods, however, are identical to those of the male, a condition not heretofore described. Apparently this is a distinct phenotype, but whether it is sufficiently distinct to prevent interbreeding is unknown of course. Another group of specimens is composed only of females

having lageniform eyes but head lobes intermediate in shape between *E. afer* and *E. atlanticus*. Provisionally these specimens have been assigned to *E. pacificus* Schellenberg (1938a), a species described as having the eyes and head lobes of Stebbing's *E. atlanticus* but exhibiting quantitative gnathopodal differences. The gnathopods are smaller in both sexes, with the male second gnathopodal finger overlapping the less oblique palm and the female gnathopod lacking the definition seen in *E. atlanticus*. Schellenberg did not figure the head and eyes. The head lobes of the present specimens are clearly discernible from those of *E. atlanticus* and *E. afer* as described by Stebbing but approach closely Pillai's figure of the head of *E. afer*.

Another species, *Eurystheus imminens* K. H. Barnard (1916 and 1937), is probably a mutant of *E. atlanticus* and is based on a slight difference in palmar tooth structure of the male second gnathopods.

If the specimens herein assigned to *E. pacificus* are really what Schellenberg described, then Micronesia supports a mutant form of *E. atlanticus* and a distinct but close relative, *E. pacificus*, bearing close resemblance to *E. afer*, because of its intermediate head and eyes.

Probably a complex of specific populations exists, each maintaining separation in different geographical areas but assuming different morphological appearances in distantly separated regions. Simply stated, species A in area 1 approaches the morphology of species B in area 2 but species B in area 1 is quite distinct from species B in area 2; hence, it differs notably from species A.

The genus *Audulla* was described originally by Chevreux in the family Ischyroceridae but Stebbing (1906) correctly listed it as a photid. In the Photidae, *Audulla chelifera*, the type species, keys out to the genus *Eurystheus* Bate. A comparison of *A. chelifera* with *Eurystheus maculatus* (=*E. tridentatus*), the type species of *Eurystheus*, shows that male *Audulla* differs from male *Eurystheus* by the following characters: the stouter second antennal flagellum, the very short fifth article of gnathopod 2 and the transverse semichelate palm of gnathopod 2. Since 1901 a number of species of *Eurystheus* have been described carrying a second gnathopod approaching the transverse palm and even the semichelate condition of *Audulla*. The condition in *Audulla* might be interpreted as a coarse defining tooth with a medial excavation which, in a qualitative sense, is scarcely different from some of the following species: *Eurystheus lina*, *E. semichelatus*, *E. crassipes*, *E. chiltoni*, *E. longimanus*, *E. scissimanus*, and *E. abyssalis*. The following three species have a shortened fifth article of gnathopod 2: *E. anamae*, *E. ostroumowi*, and *E. lobatus*. The gnathopods of *E. semichelatus* and *E. lina* are notably similar to *Audulla;* hence, only the stoutness of the second antennal flagellum remains as a

distinction between the two genera and I regard this as a minor, quantitative feature, of no generic value. The submergence of *Audulla* in *Eurystheus* is recommended.

The following species are peculiar in that the telson is deeply emarginate: *E. lina*, *E. chiltoni*, and *E. haswelli*. The wide variation of characteristics in *Eurystheus*, particularly in the gnathopods, suggests that such variability of the telson is specifically inconsequential in the genus. On the other hand these may represent cases where only the upper part of the telson has been observed while the lower posterior flap of the telson was not seen or drawn.

Eurystheus atlanticus (Stebbing), aberrant form

FIGURE 29

Gammaropsis atlantica Stebbing, 1888, p. 1101, pl. 114.
Gammaropsis zeylanicus Walker, 1904, pp. 282–283, pl. 6, fig. 41; 1909, p. 339.
Gammaropsis Gardineri Walker, 1905, pp. 929–930, pl. 88, figs. 11–14, 16, 17.
Eurystheus atlanticus.—Stebbing, 1906, p. 611; 1908, pp. 86–87, pl. 40B; 1910a, p. 461; 1910b, p. 614, 648.—Chilton, 1921, p. 81.—Tattersall, 1922, pp. 10–11, pl. 1, figs. 17–20.—Schellenberg, 1926, pp. 375–376.—Hale, 1927, p. 315.—Chevreux, 1927, pp. 110–111.—Hale, 1929, p. 223, fig. 220.—Chevreux, 1935, p. 126.—K. H. Barnard, 1937, p. 164.—Pirlot, 1938, pp. 345–346.—Reid, 1951, p. 258.—Pillai, 1957, pp. 56–57, fig. 14.—Ruffo, 1959, p. 19.

Materials: Reish stations E–45 (1), E–145 (10).

Remarks: Apparently this species is most variable, especially in its eyes, ranging from lageniform to flask-shaped to oval. The type

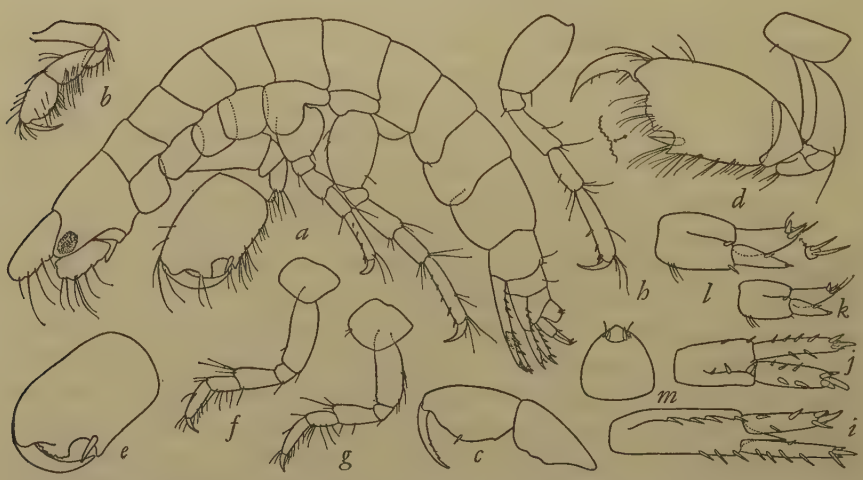

FIGURE 29.—*Eurystheus atlanticus* (Stebbing), female, 4.5 mm., Reish sta. E–142: *a*, lateral view; *b*,*c*, gnathopod 1; *e*, gnathopod 2, lateral view; *f*–*h*, pereopods 1, 2, 5; *i*–*l*, uropods 1, 2, 3, 3; *m*, telson; male, 4 mm.: *d*, gnathopod 2.

specimen had lageniform eyes; Chilton (1921) reported nearly oval eyes with only a remnant of the neck; Walker (1905) had the oval-eyed form and Tattersall (1922) had both lageniform and oval-eyed specimens.

The present specimens have oval eyes but, in addition, they are unique because the females have gnathopods like those of the male, with an excavate palm. See discussion under the generic heading (p. 531).

Distribution: Tropical Atlantic; Red Sea; Indo Pacific, previously known eastward through Indonesia; Eniwetok Atoll, Marshall Islands.

Eurystheus digitatus Schellenberg

FIGURE 30

Eurystheus digitatus Schellenberg, 1938a, pp. 84–86, fig. 44.

Material: Abbott stations 13–C–1 (1), 14–B–3 (11), 19–E–3 (3), 28–D–3 (5), 31–D–2 (1), 32–G–3 (2), 39–E–5 (3), 41–D–3 (1), 66–E–10 (3); Reish stations E–40 (1), E–68 (1).

Material, females only: Abbott stations 15–C–2 (2), 42–F–2 (2), 46–E–2 (2), 49–E–2 (2), 83–E–1 (2); Reish stations E–20 (1), E–24 (4), E–28 (1), E–38 (1), E–41 (1), E–93 (4), E–96 (1), E–137 (4).

Remarks: The dubious females have been compared with other material in which females are associated with males and correspond with them. A possible difficulty in distinguishing these females from as yet undescribed females of *E. setiferus* Schellenberg (1938a) should be pointed out. According to Schellenberg, males of *E. setiferus* are

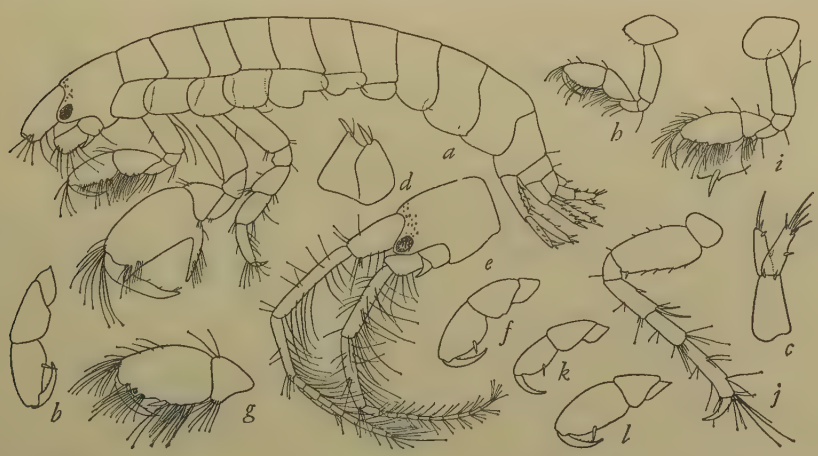

FIGURE 30.—*Eurystheus digitatus* Schellenberg, male, 3.7 mm., Reish sta, E–40: *a*, lateral view; *b*, gnathopod 1; *c*, uropod 3; *d*, telson; ?female, 5 mm., Reish sta. E–93: *e*, head; *f,g*, gnathopods 1, 2; female, 3 mm., Abbott sta. 15–C–2: *h,i*, gnathopods 1, 2; *j*, pereopod 5; female, 3.4 mm., Reish sta. E–93: *k,l*, gnathopods 1, 2.

especially noticeable by the very setose pereopods but the males and females of *E. digitatus* also are conspicuous for this condition; such was not mentioned by Schellenberg. Because of the lack of male *E. setiferus* in the collections, all of these "*E. setiferus*" females have been identified as *E. digitatus* since that species is abundantly represented by males.

One way to identify females of this species is by the spots of pigment forming a crown around the top of the head above the eyes; both males and females often have these small spots and no other male of *Eurystheus* in the collections has these. The spots are not to be likened to stray ommatidia but are distinct, small, irregular blots of pigment below the chitin; however, not all otherwise easily recognizable males have these spots in alcohol and so complete reliance cannot be made on them.

Distribution: Gilbert and Ellice Islands; Ifaluk Atoll, Caroline Islands; Eniwetok Atoll, Marshall Islands.

Eurystheus ?pacificus Schellenberg

FIGURE 31

Eurystheus pacificus Schellenberg, 1938a, pp. 80–82, fig. 42.

Material: Abbott stations 72–G–3 (2), 155–157–G–1 (1), 160–165–J–5 (1), 197–198–F–1 (10); Reish station E–41 (2).

Remarks: All the specimens collected are females. In one case the female was associated with a male of *Megamphopus abbotti*, new

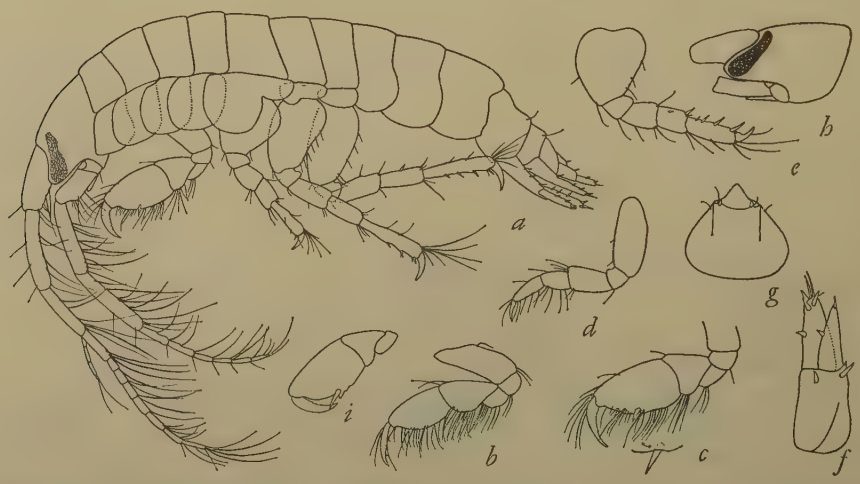

FIGURE 31.—*Eurystheus ?pacificus* Schellenberg, female, 4.6 mm., Reish sta. E–41: *a*, lateral view; *b*,*c*, gnathopods 1, 2; *d*,*e*, pereopods 1, 3; *f*, uropod 3; *g*, telson; female, 4 mm., Abbott sta. 72–G–3: *h*, head; *i*, gnathopod 2.

species, which may indicate that the specimens are very large females of *M. abbotti*, but the shape of the lateral lobes on the head and the bleached condition of the eyes and head mark these specimens strongly from *M. abbotti*. Only one bleached male of *M. abbotti* has been discovered. The first point of difficulty is that the present specimens of *E. pacificus* have 3–4 large spines on the posterior edge of article 6 on pereopod 3 just as in *M. abbotti*; this has never been indicated for *E. atlanticus* or *E. pacificus* but has been shown for *E. afer* (Stebbing, 1888, pl. 114).

The second point of difficulty is that Schellenberg (1938a) has described *E. pacificus* as having eyes and lateral head lobes resembling *E. atlanticus* by Stebbing (1888). The lateral lobes of the present specimens are not as produced as in *E. atlanticus* (compare figures herein, Stebbing 1888, Walker 1905 of *E. gardineri*, and Pillai 1957). Yet they are not quite as short as in *E. afer* (Stebbing 1888, and J. L. Barnard 1961) but are more like those of *E. afer* as figured by Pillai (1957). Most certainly the specimens at hand are distinct from the *E. atlanticus* cited herein and are distinct from Stebbing's and J. L. Barnard's portrayals of *E. afer*. They cannot be firmly set as *E. pacificus*, since males are not present; the second gnathopods are like those of the female of *E. pacificus* as drawn by Schellenberg (1938a) with one exception: an animal from 72–G–3 has the second gnathopod approaching that of *E. atlanticus* as figured by Schellenberg, wherein a distinctly defined palm is shown.

See the remarks on this problem in the introduction to this genus.

Distribution: Ellice, Gilbert, and Marshall Islands; Nauru; Ifaluk Atoll, Caroline Islands.

Genus *Megamphopus* Norman

Megamphopus abbotti, new species

FIGURE 32

Diagnosis: Lateral lobes of head not pedunculate, projecting conically forward, eyes dark, sublageniform; accessory flagellum 2-articulate; palm of gnathopod 2 transverse, with a small excavation and large spine near the defining angle of the palm, article 7 stout, apically incised; uropod 1 with a long peduncular tooth as long as the outer ramus, uropod 2 lacking tooth; telson rounded apically, with 2 false dorsal lobes, each armed with a spine and a seta.

Female: Gnathopod 2 with slightly oblique palm cut into minute subcastellations, with a tooth and a large spine at lower corner.

The head and body are moderately stained with diffuse pigment, especially around the dark eyes.

Holotype: USNM 105872, male, 2.75 mm.

Type locality: Abbott station 166–G–3, Ifaluk Atoll, Oct. 25, 1953.

Material: Abbott stations 160–165–J–5 (1), 166–G–3 (6); Reish station E–45 (1).

Relationship: Although technically this species belongs to the genus *Megamphopus* as revised by J. L. Barnard (1962a), it bears closer

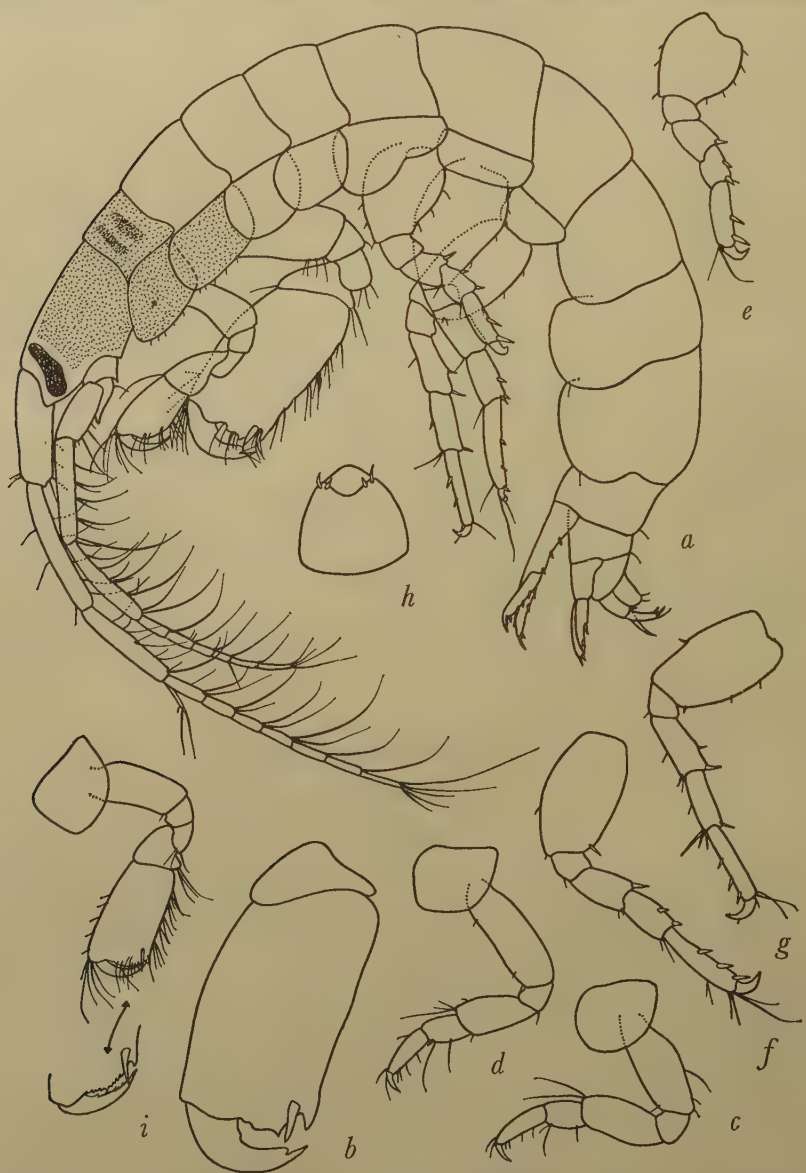

FIGURE 32.—*Megamphopus abbotti*, new species, holotype, male, 2.75 mm., Abbott sta. 166–F–3: *a*, lateral view; *b*, gnathopod 2; *c–g*, pereopods 1, 2, 3, 4, 5; *h*, telson; female, 3 mm.: *i*, gnathopod 2.

relationship to several species of *Eurystheus*. This relationship involving gnathopods, head, and eyes further points to the artificiality of the arrangement made by J. L. Barnard and the difficulty in separating several photid genera. The accessory flagellum is bi-articulate whereas the genus *Eurystheus* has a 3+ articulate flagellum. No species of *Megamphopus*, as listed by J. L. Barnard (1962a), has yet been found in the Indo-Pacific and *M. abbotti* is apparently simply a *Eurystheus* that has lost one more flagellar article.

This species differs from *Eurystheus semichelatus* K. H. Barnard (1957) and *E. lina* Kunkel (1910) by not having a distinctly semichelate second gnathopodal palm; from *E. crassipes* Haswell (1880) by the longer, narrower sixth article of gnathopod 2, bearing a nonexcavate palm; from *E. scissimanus* K. H. Barnard (1925) by the lack of a medial palmar excavation on gnathopod 2. It differs from *E. minutus* Chevreux (1926) by the more elongated eyes, the narrower, more elongated sixth article of gnathopod 2, and the slightly different palmar configuration.

Because of the eye structure this species is easily confused with *Eurystheus afer* (Stebbing 1888) but the palm of the second gnathopod in *E. afer* is oblique and article 6 is not as rectangular.

Distribution: Ifaluk Atoll, Caroline Islands; Eniwetok Atoll, Marshall Islands.

Family Ampithoidae

Key to Genera

1. Mandible lacking palp . . . . . **Sunamphitoe**
   Mandible bearing palp 2
2. Antenna 1 lacking accessory flagellum 3
   Antenna 1 bearing accessory flagellum 6
3. Gnathopod 1 larger and stouter than gnathopod 2 . . . . . **Exampithoe**
   Gnathopod 1 smaller and more slender than gnathopod 2 4
4. Gnathopods feeble, chelate . . . . . **Macropisthopus**
   Gnathopods large, subchelate 5
5. Article 6 of pereopods 3–5 widened apically . . . . . **Pleonexes**
   Article 6 of pereopods 3–5 not widened apically . . . . . **Ampithoe**
6. Outer ramus of uropod 3 bearing 1 hook . . . . . **Amphithoides**
   Outer ramus of uropod 3 bearing 2 hooks 7
7. Gnathopod 1 larger than gnathopod 2 . . . . . **Paragrubia**
   Gnathopod 1 smaller than gnathopod 2 . . . . . **Cymadusa**

According to this key, *Ampithoe megaloprotopus* Stebbing (1906, p. 633) should be transferred to *Exampithoe*. *Amphitholina* Ruffo was transferred to the family Eophliantidae by Gurjanova (1958).

768-792—65——6

Genus *Ampithoe* Leach

Ampithoe ramondi Audouin

Ampithoe ramondi Audouin.—J. L. Barnard, 1955, pp. 28–29 (with references).

Material: Hand station CH–551 (1); Reish stations E–6 (3), E–13 (1), E–20 (2), E–24 (6), E–26 (6), E–44 (1), E–72 (6), E–74 (3), E–82 (8), E–94 (2), BE–103 (2), BE–104 (1), E–116 (1), E–127 (10), E–128 (11), E–129 (1), E–143 (5), E–144 (24), E–145 (9), E–171 (14), E–172 (5), E–184 (4).

Distribution: Pantropical.

Genus *Cymadusa* Savigny

Cymadusa brevidactyla (Chevreux)

Grubia brevidactyla Chevreux, 1907, pp. 416–417; 1908, pp. 517–521, figs. 30–32.—Schellenberg, 1938a, p. 87.

Material: Bayer station 628 (2).

Remarks: The single adult is a female, the other specimen a juvenile. The female is distinguishable from females of *C. filosa* by the very narrow hindlobe of article 5 on gnathopod 2.

Distribution: Gambier and Tuamotu Archipelagos; Gilbert and Ellice Islands; Nauru; Ifaluk Atoll, Caroline Islands.

Cymadusa filosa Savigny

Cymadusa filosa Savigny.—J. L. Barnard, 1955, pp. 29–30, fig. 15 (with references).—Ruffo, 1959, p. 19.

Material: Abbott stations 19–E–3 (1), 23–E–2 (1), 42–F–2 (2), 76–H–3 (1), 83–E–1 (1), 84–D–1 (8), 90–C–4 (2), 91–E–2 (4), 95–L–4 (2), 112–I–5 (1), 113–H–2 (1), 116–F–3 (1), 123–D–2 (7), 139–C–2 (1), 144–F–2 (2), 145–C–3 (5), 177–G–5 (7), 179–184–M–1 (11), 192–D–6 (1); Bayer station 588 (1); Reish stations E–2 (1), E–6 (2), E–15 (1), E–25 (5), E–38 (41), E–40 (5), E–41 (1), E–42 (2), E–48 (2), E–50 (2), E–55 (4), ME–57 (1), ME–60 (7), E–75 (4), E–81 (6), E–82 (2), E–95 (2), BE–109 (7), BE–114 (6), E–119 (1), E–120 (1), E–128 (1), E–129 (4), E–136 (4), E–163 (1), E–171 (4), E–172 (8).

Remarks: Ruffo (1959) expressed doubt that materials reported by J. L. Barnard (1955) from the Hawaiian Islands are indeed this species because of the poorly setose gnathopods; Barnard's figures of the apparently young male correspond with Shoemaker's (1935, figs. 5g, h) figures of the female. Apparently, the fully setose condition is characteristic of aged males and none of these has been seen by me from the tropical Pacific, except those found on floating debris.

Distribution: Tropical and warm-temperate cosmopolitan.

Genus *Paragrubia* Chevreux

Paragrubia vorax Chevreux

FIGURE 33

Paragrubia vorax Chevreux, 1901, pp. 427–431, figs. 50–55.—J. L. Barnard, 1955, pp. 31–34, fig. 17 (with references).

Material: Reish stations E–6 (3), E–20 (8), E–38 (1), E–43 (2), E–55 (2), E–76 (1), E–83 (14), E–85 (1), E–93 (3), BE–107 (2), E–120 (2), E–136 (1).

Remarks: Externally, the young of this species are difficult to separate from several species of the Aoridae. Of course, the principal character of the Ampithoidae is the notched outer lobes of the lower lip but this requires dissection of each specimen. The attached third uropods are quite like those of some aorids. The outer ramus of the third uropods in most Ampithoidae clearly bears one or two spine-hooks but those of *Paragrubia* are nearly straight or scarcely hooked

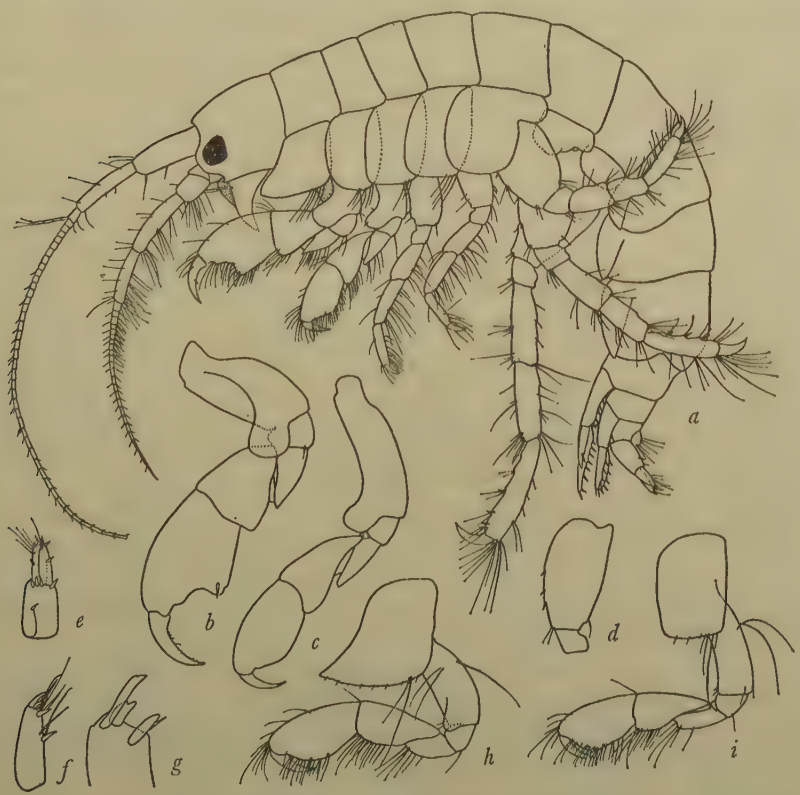

FIGURE 33.—*Paragrubia vorax* Chevreux, male, 9 mm., Reish sta. E–20: *a*, lateral view; *b,c*, gnathopods 1, 2; *d*, pereopod 5; *e*, uropod 3; *f,g*, outer ramus of uropod 3; juvenile 5.5 mm.: *h,i*, gnathopods 1, 2.

and not easy to recognize as normally ampithoid. Thus, the genus is easily confused with aorids because it is an ampithoid with enlarged first gnathopods. Young of the species resemble *Microdeutopus tridens*, with which they might be confused on the basis of the acutely produced first coxa. From various species of *Lembos* they are segregated by the very slender, poorly setose mandibular palps, which can be seen projecting anteriorly below the second antennae; species of *Lembos* have well-developed palps with falcate, setose third articles.

Distribution: Indo-Pacific tropical.

Genus *Pleonexes* Bate

Pleonexes (?) Species

FIGURE 34

Diagnosis: Antennae missing; eyes large, nearly round; article 5 of gnathopod 1 shorter than 6, the palm of article 6 oblique; gnathopod 2 with anterodistal edge of article 2 produced into a large leaflike process, article 5 very short, lobate, article 6 large, as broad as long, palm nearly transverse, slightly convex, lacking defining spine, article

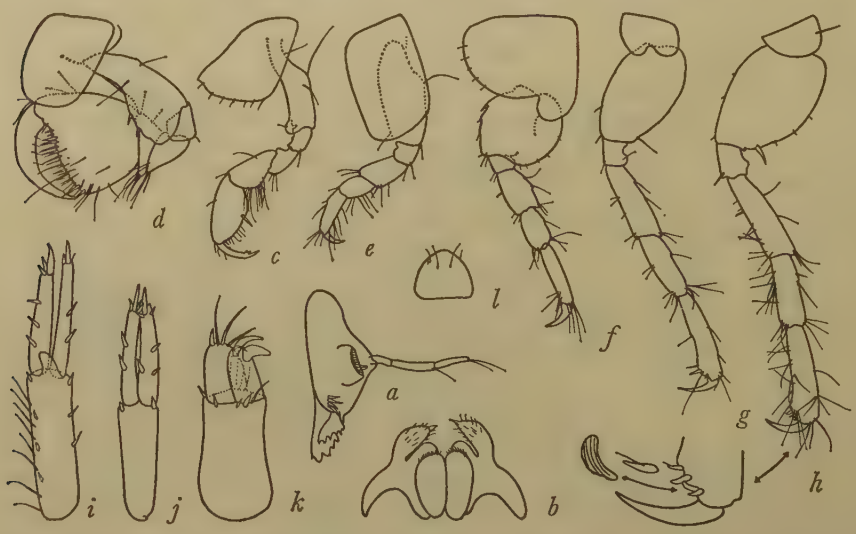

FIGURE 34.—*Pleonexes* species, male, 4 mm., Abbott sta. 141–D–3: *a*, mandible; *b*, lower lip; *c*,*d*, gnathopods 1, 2; *e–h*, pereopods 1, 3, 4, 5; *i–k*, uropods 1, 2, 3; *l*, telson.

7 curved, fitting palm; article 2 of pereopods 1–2 stout, article 4 not produced in front; pereopods 3–5 with distal end of article 6 slightly widened, bearing 4 stout teeth, one of which is folded back on the false palm and is heavily striated; article 2 of pereopod 3 with stout proximal anterior spine; uropods 1 and 2 with spines on both rami, spines sparse on peduncles; telson linguiform, rounded apically, lacking large hooks.

Material: Abbott station 141–D–3 (1).

Remarks: It is questionable that this species is a *Pleonexes* because of the telson lacking the hooks seen in *P. gammaroides* and *P. lessoniae*. It may prove that the telson is the only qualitative feature distinguishing *Pleonexes* from *Ampithoe* because the widening of the sixth article on pereopods 3–5 is quantitative and occasionally approached by several species of *Ampithoe*. The mouthparts are similar to *P. gammaroides* (Sars, 1895, pl. 207) except for the mandible and lower lip, figured herein. The mouthparts are quite distinct from those of *P. lessoniae* (Hurley, 1954). This specimen differs from any known species of *Ampithoe* by its peculiar second gnathopods.

Distribution: Ifaluk Atoll, Caroline Islands.

Family Podoceridae

Genus *Podocerus* Leach

To gain any concept of this genus and the limits of variation within a species is nearly impossible at the present time as seen in the following discussion and J. L. Barnard's (1962a) remarks. The earliest described species, *P. brasiliensis* (Dana, 1853), *P. lobatus* (Haswell, 1885), *P. laevis* (Haswell, 1885), and *P. cristatus* (Thomson, 1879), were not well detailed. Apparently overlooked in the last 3 species were the proper configurations of the teeth on male gnathopod 2. Later identifications of *P. laevis* by Walker (1904) and Chilton (1926) differ completely in the respective absence and presence of 3 widely separated teeth on the male gnathopod 2 palm; Walker's figure is more like the original description. Chilton's (1926) figure of male gnathopod 2 on *P. cristatus* establishes the species. On the other hand J. L. Barnard's (1959) figure of *P. brasiliensis* probably shows a younger stage of this same gnathopod, yet he was able to distinguish *P. brasiliensis* as a common harbor-dwelling, noncristate amphipod from a related cristate species, occurring more commonly in the open sea. The latter resembles *P. cristatus* in the dorsal keel but bears only one palmar tooth on gnathopod 2. Pirlot (1938) showed the wide variation in dorsal carination of two other species, hence demonstrating its uselessness. For the time being we must resort to gnathopodal configurations as specific criteria. Pirlot's (1938) figure of *P. lobatus* most certainly appears distinct from Haswell's original figures. The commonly reported *P. brasiliensis* has never been refigured since it was redescribed by Walker (1904) as *P. synaptochir*, except by J. L. Barnard (1959). Indeed Barnard's identification may be erroneous and the specimens might be named as *P. variegatus* Leach. K. H. Barnard (1916) suggested that *P. variegatus* and *P. brasiliensis* may be identical, a reasonable opinion.

It is easy to imagine that such species as *P. mangarevae* Chevreux (1908), *P. senegalensis* Chevreux (1926), and *P. zeylanicus* (Walker 1904) are simply variants and the relationship of this complex is very close to *P. chelonophilus* (Chevreux and de Guerne).

A study of variation and growth stages based on topotype materials is needed in this group before the taxonomy can be clarified.

Podocerus talegus, new species

FIGURE 35

Diagnosis of male: Eyes large; palm of gnathopod 1 bulbous, slightly longer than hindmargin of article 6, bearing stout setae; anterodistal end of article 2 on gnathopod 2 with a large lobe, article 4 acutely produced, article 6 slightly elongated, anterior edge convex, posterior edge nearly straight, palm not distinct from hindmargin, bearing 2 small bumps and a crenulate margin between distal bump and hinge, article 6 reaching two thirds along hindmargin; article 2 of pereopods 1–2 not inflated; spines sparse on uropods 1–2; hinddorsal margins of pleonal segments 1 and 2 and pereonal segment 7 distinctly elevated but carinae not developed.

FIGURE 35.—*Podocerus talegus*, new species, holotype, male, 2.4 mm., Abbott sta. 208–C–7: *a*, lateral view; *b,c*, gnathopods 1,2 ; *d–f*, pereopods 3–5; male, 2.3 mm., Abbott sta. 41–D–3: *g*, antenna 1; female, 3 mm.: *h,i*, gnathopods 1, 2; *j,k*, pereopods 1, 5.

Female: Palm of gnathopod 2 distinct, longer than hindmargin of article 6, defined by small cusp and 2 large spines; article 4 large and produced but not as strongly as in such species as *P. mangarevae* Chevreux (1908).

Holotype: USNM 106908, male, 2.4 mm.

Type locality: Abbott station 208–C–7, Ifaluk Atoll, Sept. 30, 1953.

Material: Abbott stations 39–E–5 (1), 41–D–3 (3), 208–C–7 (7); Bayer stations 431 (1), 589 (1).

Relationship: This species bears comparison to the following species for each of which a distinguishing feature is noted:

P. cristatus: male gnathopod 2 has 3 palmar teeth near the finger hinge.

P. lobatus: male gnathopod 2 palm is defined by a tooth.

P. andamanensis: a poorly known species, needing redescription; article 4 of male gnathopod 2 not produced.

P. laevis: the original description and that of Walker (1904) have the male second gnathopodal palm straight, unarmed except for setae; the description of Chilton (1926) has the palm bearing 3 widely separated teeth.

P. inconspicuus: Pirlot (1938) has a downward produced lobe on the distal edge of article 2 on both male and female second gnathopods.

P. mangarevae: male gnathopod 1 has a narrow hindlobe on article 5; gnathopod 2 has the process of article 4 obtuse, not acute; article 4 of female gnathopod 2 is more bulbously produced; however, *P. talegus*, new species may be the young of *P. mangarevae*.

Distribution: Ifaluk Atoll, Caroline Islands.

Literature Cited

ALDERMAN, A. L.

1936. Some new and little known amphipods of California. Univ. Calif. Publ. Zoöl., vol. 41, pp. 53–74, figs. 1–51.

BARNARD, J. L.

1955. Gammaridean Amphipoda (Crustacea) in the collections of Bishop Museum. Bernice P. Bishop Mus. Bull. 215, pp. 1–146, pls. 1–20.

1958. Index to the families, genera, and species of the gammaridean Amphipoda (Crustacea). Allan Hancock Found. Publ. Occ. Pap., vol. 19, pp. 1–145.

1959. Estuarine Amphipoda. *In* Ecology of Amphipoda and Polychaeta of Newport Bay, California. Allan Hancock Found. Publ. Occ. Pap., vol. 21, pp. 13–69, pls. 1–14.

1961. Gammaridean Amphipoda from depths of 400 to 6000 meters. *Galathea* Rep., vol. 5, pp. 23–128, figs. 1–83.

1962a. Benthic Marine Amphipoda of southern California; families Aoridae, Photidae, Ischyroceridae, Corophiidae, Podoceridae. Pacific Nat., vol. 3, pp. 3–72, figs. 1–32.

1962b. Benthic Marine Amphipoda of southern California; families Tironidae to Gammaridae. Pacific Nat., vol. 3, pp. 73–115, figs. 1–23.

1962c. Benthic Marine Amphipoda of southern California; families Amphilochidae, Leucothoidae, Stenothoidae, Argissidae, Hyalidae. Pacific Nat., vol. 3, pp. 116–163, figs. 1–23.

1962d. South Atlantic abyssal amphipods collected by R. V. *Vema:* Abyssal Crustacea. *Vema* Res. Ser., no. 1, pp. 1–78, figs. 1–79.

BARNARD, K. H.

1916. Contributions to the crustacean fauna of South Africa, 5: The Amphipoda. Ann. South African Mus., vol. 15, pp. 105–302, pls. 26–28.

1925. Contributions to the crustacean fauna of South Africa, 8: Further additions to the list of Amphipoda. Ann. South African Mus., vol. 20, pp. 319–380, pl. 34.

1937. Amphipoda. *In* John Murray Expedition, 1933–34. Sci. Rep. British Mus. (Nat. Hist.), vol. 4, pp. 131–201, figs. 1–21.

1940. Contributions to the crustacean fauna of South Africa, 11: Further additions to the Tanaidacea, Isopoda, and Amphipoda, together with keys for the identification of the hitherto recorded marine and fresh-water species. Ann. South African Mus., vol. 32, pp. 381–543, figs. 1–35.

1955. Additions to the fauna-list of South African Crustacea and Pycnogonida. Ann. South African Mus., vol. 43, pp. 1–107, figs. 1–53.

1957. Additions to the fauna-list of South African Crustacea. Ann. Mag. Nat. Hist., ser. 12, vol. 10, pp. 1–12, figs. 1–8.

BATE, C. SPENCE

1862. Catalogue of the specimens of amphipodous Crustacea in the collection of the British Museum, iv + 399 pp., pls. 1, 1a, 2–58.

BULYCHEVA, A. I.

1952. Novye vidy bokoplavov (Amphipoda, Gammaridea) iz Japonskogo Morja. Akad. Nauk. SSSR, Trudy Zool. Inst., vol. 12, pp. 195–250, figs. 1–39.

1957. Morskie bloxi morej SSSR i sopredel'nyx vod (Amphipoda-Talitroidea). Akad. Nauk. SSSR, Opred. po Faune SSSR, vol. 65, pp. 1–185, figs. 1–66.

CECCHINI, C.

1928. R. Comit. Talass. It. Mem. 142, p. 5, pl. 1, fig. 3.

CHEVREUX, E.

1901. Crustacés amphipodes. *In* Mission Scientifique de M. Ch. Alluaud aux Iles Séchelles (Mars, Avril, Mai, 1892). Mem. Soc. Zool. France, vol. 14, pp. 388–438, figs. 1–65.

1907. Diagnoses d'amphipodes nouveaux recueillis dans les possessions françaises de l'Océanie, par M. L. Seurat, Directeur du laboratoire de recherches biologiques de Rikitea. Bull. Mus. Hist. Nat. Paris, 1907, no. 6, pp. 412–417.

1908. Amphipodes recueillis dans les possessions françaises de l'Océanie par M. le Dr. Seurat, Directeur du laboratorie de recherches biologiques de Rikitea (îles Gambier), 1902–1904. Mem. Soc. Zool. France, vol. 20, pp. 470–527, figs. 1–35.

1911. Campagnes de la Melita: Les amphipodes d'Algerie et de Tunisie. Mem. Soc. Zool. France, vol. 23, pp. 145–285, pls. 6–20.

1925. Amphipodes, 1: Gammariens. *In* Voyage de la Goélette *Melita* aux Canaries et au Sénégal (1889–1890). Bull. Soc. Zool. France, vol. 50, pp. 278–311, figs. 1–12.

1926. Amphipodes, 1: Gammariens (cont.). *In* Voyage de la Goélette *Melita* aux Canaries et au Sénégal (1889–1890). Bull. Soc. Zool. France, vol. 20, pp. 365–398, figs. 13–35.

1927. Crustacés amphipodes: Expéd. Sci. "Travailleur" et du "Talisman" pendant les annés 1880, 1881, 1882, 1883. Malacostracés vol. 9, pp. 41–152, pls. 1–14.

1935. Amphipodes provenant des campagnes du Prince Albert Ier de Monaco. Rés. Campagnes Sci. Albert Ier, Monaco, vol. 90, pp. 1–214, pls. 1–16.

CHEVREUX, E., and FAGE, L.

1925. Amphipodes. Faune de France, vol. 9, pp. 1–488, figs. 1–438.

CHILTON, C.

1906. Report on some Crustacea dredged off the coast of Auckland. Trans. New Zealand Inst., vol. 38, pp. 265–268.

1912. The Amphipoda of the Scottish National Antarctic Expedition. Trans. Roy. Soc. Edinburgh, vol. 48, pp. 455–520, pls. 1–2.

1929. The crustaceans of South Australia. Vol. 2 *of* Handbooks of the Flora and Fauna of South Australia, pp. 201–380, figs. 202–364.

DANA, J. D.

1853. Crustacea, 2. *In* U.S. Explor. Exped., vol. 14, pp. 691–1018; atlas, 96 pls.

DAWSON, E. Y.

1957. An annotated list of marine algae from Eniwetok Atoll, Marshall Islands. Pacific Sci., vol. 11, pp. 92–132, figs. 1–31.

EMERY, K. O.; TRACEY, J. I., JR.; and LADD, H. S.

1954. Geology of Bikini and nearby atolls. Geol. Surv. Prof. Pap. 260–A, pp. 1–265, pls. 1–64, figs. 1–84, charts 1–11.

GURJANOVA, E.

1951. Bokoplavy morei SSSR i sopredel'nyx vod (Amphipoda-Gammaridea). Opred. po Faune SSSR, Izd. Zool. Inst. Akad. Nauk, vol. 41, pp. 1–1031, figs. 1–705.

1958. K faune amfipod (Amphipoda) ostrova Makkuori. Biol. Sovet. Antarkt. Exped., no. 3, pp. 55–56.

HALE, H. M.

1927. The fauna of Kangaroo Island, South Australia, 1: The Crustacea. Trans Proc. Roy. Soc. So. Australia, vol. 51, pp. 307–321, figs. 1–7.

HASWELL, W. A.

1879a. On Australian Amphipoda. Proc. Linn. Soc. New South Wales, vol. 4, pp. 245–279, pls. 7–12.

1879b. On some additional new genera and species of amphipodous crustaceans. Proc. Linn. Soc. New South Wales, vol. 4, pp. 319–350, pls. 18–24.

1880. On some new amphipods from Australia and Tasmania. Proc. Linn. Soc. New South Wales, vol. 5, pp. 97–105, pls. 5–7.

1882. Catalogue of the Australian stalk-and-sessile-eyed Crustacea, Australian Museum, Sydney, xxiv + 324 pp. (plus Addenda et Corrigenda), 4 pls.

1885. Notes on the Australian Amphipoda. Proc. Linn. Soc. New South Wales, vol. 10, pp. 95–114, pls. 10–18.

HURLEY, D. E.

1954. Studies on the New Zealand amphipodan fauna, 2: The freshwater genus *Chiltonia* Stebbing (family Talitridae). Trans. Roy. Soc. New Zealand, vol. 81, pp. 563–577, figs. 1–3.

1957. Studies on the New Zealand amphipodan fauna, 14: The genera *Hyale* and *Allorchestes* (family Talitridae). Trans. Roy. Soc. New Zealand, vol. 84, pp. 903–933, 169 figs.

IWASA, M.

1939. Japanese Talitridae. Journ. Fac. Sci. Hokkaido Imp. Univ., ser. 6 (Zool.), vol. 6, pp. 255–296, figs. 1–27, pls. 9–22.

1916. Some Australian and New Zealand Gammaridae. Trans. Proc. New Zealand Inst., vol. 48, pp. 359–370, figs. 1–6.

1921. Report on the Amphipoda obtained by the F.I.S. "Endeavour" in Australian seas. *In* Biol. Res. Fish. Exped. F.I.S. "Endeavour" 1909–14, vol. 5, pp. 33–92, figs. 1–16.

1923. Occasional notes on Australian Amphipoda. Rec. Australian Mus., vol. 14, pp. 79–100, figs. 1–4.

1926. New Zealand Amphipoda, 6. Trans. Proc. New Zealand Inst., vol. 56, pp. 512–518, figs. 1–4.

Kunkel, B. W.

1910. The Amphipoda of Bermuda. Trans. Connecticut Acad. Arts Sci., vol. 16, pp. 1–116, figs. 1–43.

Maccagno, T.

1936. Crostacei di Assab Decapodi Stomatopodi Anfipodi: Spedizione del Barone Raimondo Franchetti in Dancalia (1928–29). Ann. Mus. Civ. Stor. Nat. Genova, vol. 59, pp. 171–186.

Oliveira, L. P. H.

1951. The genus *Elasmopus* on the coast of Brazil with description of *Elasmopus besnardi* new species and *E. fusimanus* new species (Crustacea, Amphipoda). Bol. Inst. Paulista Oceanogr., vol. 2, pp. 3–35, pls. 1–9.

1953. Crustacea Amphipoda do Rio de Janeiro. Mem. Inst. Oswaldo Cruz, vol. 51, pp. 289–376, pls. 1–27.

Pillai, N. K.

1957. Pelagic Crustacea of Travancore, 3: Amphipoda. Bull. Cent. Res. Inst. Univ. Travancore, vol. 5, pp. 29–68, figs. 1–18.

Pirlot, J. M.

1936. Les Amphipodes . . . Deuxième partie. Les amphipodes gammarides. II.—Les amphipodes de la mer profonde. 3. Addendum et partie générale.—III.—Les amphipodes littoraux. 1. Lysianassidae, Ampeliscidae, Leucothoidae, Stenothoidae, Phliantidae, Colomastigidae, Ochlesidae, Liljeborgiidae, Oedicerotidae, Synopiidae, Eusiridae, Gammaridae. Monogr. 33c (vol. 127) *in* Weber, Siboga-Expeditie, pp. 237–328, figs. 102–146.

1938. Les Amphipodes . . . Deuxième partie. Les amphipodes gammarides. III.—Les amphipodes littoraux. 2. Familles des Dexaminidae, Talitridae, Aoridae, Photidae, Ampithoidae, Corophiidae, Jassidae, Cheluridae et Podoceridae. Monogr. 33f (vol. 132) *in* Weber, Siboga-Expeditie, pp. 329–359, figs. 147–161.

Poisson, R., and Legueux, M. L.

1926. Notes sur les crustacés amphipodes, 1: Crustacés amphidoes marins littoraux de la zone dite du "Trottoir" des environs de Banyuls-sur-mer; 2; Étude comparée du *Corophium acutum* Chevreux et d'un *Corophium* d'eau saumatre du canal de Caen. Bull. Soc. Zool. France, vol. 51, pp. 314–325, figs. 1–6.

Reid, D. M.

1951. Report on the Amphipoda (Gammaridea and Caprellidea) of the coast of tropical West Africa. Atlantide Rep., vol. 2, pp. 189–291, figs. 1–58.

Ruffo, S.

1938. Studi sui crostacei anfipodi, 8: Gli anfipodi marini del Museo Civico di Storia Naturale di Genova a) Gli anfipodi del Mediterranea. Ann. Mus. Civ. Stor. Nat. Genova, vol. 60, pp. 127–151, fig. 1.

1947. Studi sui crostacei anfipodi, 14: Su alcune specie di anfipodi dell'Atlantico Orientale (Isole Azorre, Canarie, del Capoverde, Annobon, Guinea Portoghese, Africa Australe). Mem. Mus. Civ. Stor. Nat. Verona, vol. 1, pp. 113–130, figs. 1–5.

1950. Studi sui crostacei anfipodi, 22: Anfipodi del Venezuela raccolti dal Dott. G. Marcuzzi. Mem. Mus. Civ. Stor. Nat. Verona, vol. 2, pp. 49–65, figs. 1–5.

1954. Studi sui crostacei anfipodi, 40: Nuovi anfipodi raccolti del Venezuela dal Prof. G. Marcuzzi. Mem. Mus. Civ. Stor. Nat. Verona, vol. 4, pp. 117–125, figs. 1–2.

1956. Nota su lacuni anfipodi raccolti sulle coste dell'India dal Dr. K. Lindberg. Mem. Mus. Civ. Stor. Nat. Verona, vol. 5, pp. 211–216.

1959. Contributions to the knowledge of the Red Sea, 13: Contributo alla conoscenza degli anfipodi del Mar Rosso (1). Sea Fish. Res. Sta. Haifa Bull., vol. 20, pp. 1–36, figs. 1–6.

SARS, G. O.

1895. Amphipoda: An account of the Crustacea of Norway with short descriptions and figures of all the species, vol. 1, viii + 711 pp., 240 pls., 8 suppl. pls.

SAYCE, O. A.

1901. Description of some new Victorian fresh-water Amphipoda. Proc. Roy. Soc. Victoria, vol. 13, n.s., pp. 225–242, pls. 36–40.

SCHELLENBERG, A.

1926. Die Gammariden . . . . Vol. 18 *of* Deutsche Südpolar-Expedition 1901–1903, pp. 235–414, figs. 1–68.

1928. Report on the Amphipoda. *In* Zoological Research Cambridge Expedition Suez Canal, 1924. Trans. Zool. Soc. London, vol. 22, pp. 633–692, figs. 198–209.

1929. Revision der Amphipoden-Familie Pontogeneiidae. Zool. Anz., vol. 85, pp. 273–282.

1938a. Litorale Amphipoden des tropischen Pazifiks. Kungl. Svenska Vetenskapakad. Handl., ser. 3, vol. 16, pp. 1–105, figs. 1–48.

1938b. Brasilianische Amphipoden, mit biologischen Bemerkungen. Zool. Jahrb. Syst., vol. 71, pp. 203–218, figs. 1–5.

1939. Amphipoden des Kongo-Mündungsgebietes. Rev. Zool. Bot. Afrique, vol. 32, pp. 122–138, figs. 1–29.

SHEARD, K.

1936. Amphipods from a South Australian Reef, 2. Trans. Proc. Roy. Soc. South Australia, vol. 60, pp. 173–179, pl. 17, figs. 1–4.

SHOEMAKER, C. R.

1933. Two new genera and six new species of Amphipoda from Tortugas. Pap. Tortugas Lab. Carnegie Inst. Washington, vol. 28 (publ. 435), pp. 245–256, figs. 1–8.

1935. The amphipods of Porto Rico and the Virgin Islands. *In* Scientific Survey of Porto Rico and the Virgin Islands. New York Acad. Sci., vol. 15, pp. 229–253, figs. 1–5.

1941. A new genus and a new species of Amphipoda from the Pacific Coast of North America. Proc. Biol. Soc. Washington, vol. 54, pp. 183–186.

1942. Amphipod crustaceans collected on the Presidential Cruise of 1938. Smithsonian Misc. Coll., vol. 101, pp. 1–52, figs. 1–17.

1955. Amphipoda collected at the Arctic Laboratory, Office of Naval Research, Point Barrow, Alaska, by G. E. MacGinitie. Smithsonian Misc. Coll., vol. 128, no. 1, pp. 1–78, figs. 1–20.

1956. Observations on the amphipod genus Parhyale. Proc. U.S. Nat. Mus., vol. 106, pp. 345–358, figs. 1–4.

SPANDL, H.

1923. Amphipoden der "Pola"-Expeditionen in das Rote Meer. Die Gattung *Synopia* Dana. Sitzungsanz. Akad. Wiss. Wien, Mat.-Nat. Kl., nr. 4–5 [not seen].

1924. Die Amphipoden des Roten Meeres. *In* Expeditionen S.M. Schiff "Pola" in das Rote Meer nördliche und südliche hälfte 1895–96—1897–98. Zool. Ergebn. 35, Denk. Akad. Wiss. Wien Mat. Nat., vol. 99, pp. 19–73, figs. 1–23, charts 1–5.

STEBBING, T. R. R.

1888. Amphipoda. Vol. 29 *of* Zoology *in* Report on the Scientific Results of the Voyage of H.M.S. *Challenger* during the years 1873–76, xxiv+1737 pp., 212 pls., 1 map, text illustr. [in 3 vols.].

1899. Amphipoda from the Copenhagen Museum and other sources, 2. Trans. Linn. Soc. London, ser. 2 (Zool.), vol. 8, pp. 395–432, pls. 30–35.

1906. Amphipoda, 1: Gammaridea. Vol. 21 *in* Das Tierreich, pp. 1–806, figs. 1–127.

1908. South African Crustacea, 4. Ann. South African Mus., vol. 6, pp. 1–96, pls.

1910a. General catalogue of South African Crustacea. Part 5 *of* South African Crustacea, Marine Investigations in South Africa. Ann. South African Mus., vol. 6, pp. 281–593, pls. 15–22.

1910b. Crustacea, 5: Amphipoda. *In* Scientific Research on the Trawling Expedition of H.M.C.S. "Thetis". Australian Mus., Mem. 4, vol. 2, pp. 565–658, pls. 47–60.

1917a. The Malacostraca of Durban Bay. Ann. Durban Mus., vol. 1, pp. 435–450, pls. 22–23.

1917b. South African Talitridae. Ann. Mag. Nat. Hist., ser. 8, vol. 19, pp. 330–331.

STEPHENSEN, K.

1949. The Amphipoda of Tristan da Cunha. Vol. 19 *of* Researches of the Norwegian Scientific Expedition to Tristan da Cunha 1937–1938, pp. 1–61, figs. 1–23.

TATTERSALL, W. M.

1922. Amphipoda and Isopoda. *In* The Percy Sladen Trust Expedition to the Abrolhos Islands (Indian Ocean). Journ. Linn. Soc. London, Zool., vol. 35, pp. 1–19, pls. 1–3.

THOMPSON, G. M.

1879. Additions to the amphipodous Crustacea of New Zealand. Ann. Mag. Nat. Hist., ser. 5, vol. 4, pp. 329–333, pl. 16.

TRACEY, J. L., JR.; ABBOTT, D. P.; and ARNOW, T.

1961. Natural history of Ifaluk Atoll: Physical environment. Bernice P. Bishop Mus. Bull., no. 222, pp. 1–75, figs. 1–27, 12 tables, 3 pls.

WALKER, A. O.

1904. Report on the Amphipoda collected by Professor Herdman, at Ceylon, in 1902. Suppl. Rep. Ceylon Pearl Oyster Fisheries, 1904, no. 17, pp. 229–300, pls. 1–8.

1905. Marine crustaceans, 16: Amphipoda. Fauna Geogr. Maldive and Laccadive Archs., vol. 2, suppl. 1, pp. 923–932, pl. 88.

1909. Amphipoda Gammaridea from the Indian Ocean, British East Africa, and the Red Sea. Trans. Linn. Soc. London, ser. 2 (Zool.), vol. 12, pp. 323–344, pls. 42, 43.

WALKER, A. O., and SCOTT, A.

1903. Crustacea: Malacostraca. Nat. Hist. Sokotra and Abdel-el-Kuri, pp. 216–233, pls. 14A, 14B.

U.S. GOVERNMENT PRINTING OFFICE: 1965